DECEMBER 1987
Issue #327

73 AMATEUR RADIO®

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HAND-HELD SPECIAL

Five Hot HT Reviews
Power Amp Playoff
Super Charger Projects
Hand-Held Wish List

NEW!

Profile:
Meet Janette

Newcomers
Welcome!

Exclusive!

WB6RQN's
Packet Talk

Extra!
Extra! US Frequency Privileges
Plus DX Prefix Pullout

12
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FIVE Watt IC-02ATHP (High Power) now available!

ICOM IC-02AT

IC-2AT
with IC-BP3 battery pack

IC-02ATHP
(High Power) version with IC-BP7 battery pack

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✓ = NEW FEATURE

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- • Pulse dialing
- • Toll protection
- • Secret toll override code
- • Busy signal disconnect
- ✓ Dialtone disconnect
- • CW identification
- • Activity timer
- • Timeout timer
- ✓ Telephone initiated control
- ✓ Regenerated DTMF selective calling
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- ✓ Ringout or Auto Answer on 1-8 rings
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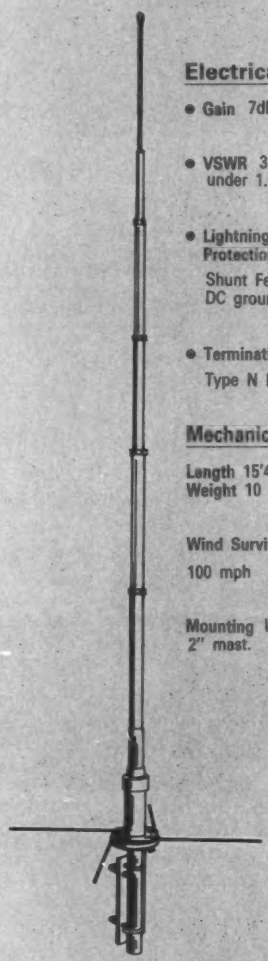


Electrical

- Gain 7dBd
- VSWR 3 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

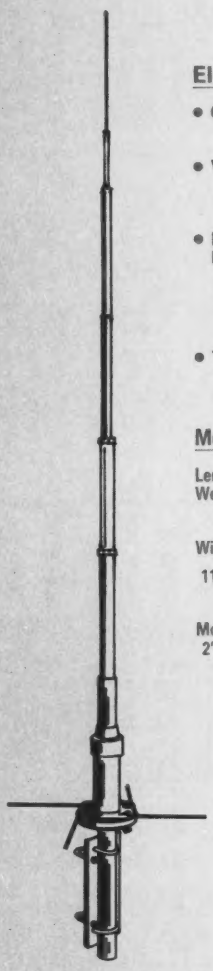
Mechanical

Length 15'4"
Weight 10 lbs.

Wind Survival
100 mph

Mounting Up to 2" mast.

G7 - 220



Electrical

- Gain 7dBd
- VSWR 4 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

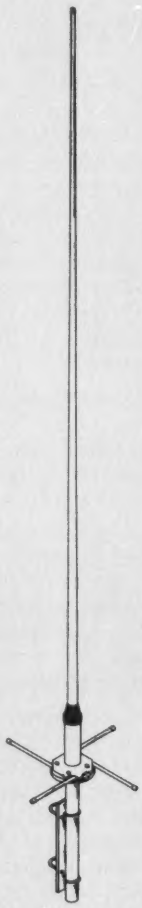
Mechanical

Length 10'2"
Weight 7.0 lbs.

Wind Survival
110 mph

Mounting Up to 2" mast.

G6 - 440



Electrical

- Gain 6dBd
- VSWR 8 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

Mechanical

Length 7'3"
Weight 16 lbs.

Wind Survival
125 mph

Mounting Up to 2" mast.

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This may be the world's most popular 3 KW roller inductor tuner because it's small, compact, reliable, matches virtually everything and gives you SWR/Wattmeter, antenna switch, dummy load and balun — all at a great price!

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs-only 10¾"Wx4½"Hx14 7/8"D.

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Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

MFJ989B **$349.95**

Lighted Cross-needle Meter reads SWR, forward and reflected power all in one glance. Has 300 and 3,000 watt ranges. Meter light requires 12 VDC.

6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

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MFJ's Fastest Selling TUNER

MFJ-941D **$99.95**

MFJ's fastest selling tuner packs in plenty of new features. New styling! Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

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Matches everything from 1.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ's 1.5 KW VERSA TUNER III

MFJ-962B **$229.95**

Run up to 1.5 kw PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

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MFJ's Best VERSA TUNER

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A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

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MFJ-1702. $19.95. 2 positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

$29.95 MFJ-1701

MFJ- 1701, $29.95. 6 positions. White markable surface for antenna positions.

MFJ's Smallest VERSA TUNER

MFJ-901B **$59.95**

MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

MFJ's Random Wire TUNER

MFJ-16010 **$39.95**

MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

MFJ's Mobile TUNER

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73 AMATEUR RADIO

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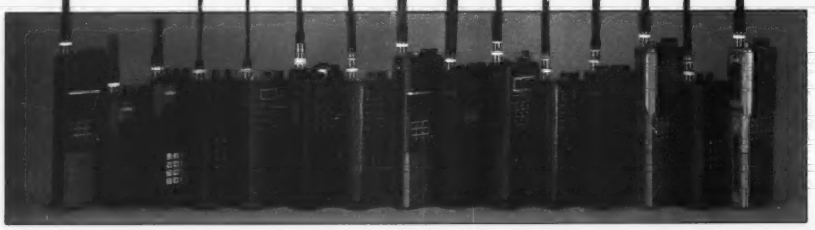

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Cover Photo by Suzanne Torsheya

Welcome, Newcomers!

Welcome to Amateur Radio! Ham lingo can baffle a newcomer at first, but it doesn't have to be a real impediment. Check the glossary of terms below to help you explore this fascinating new world.

Radio Spectrum

Radio waves, heat (infrared), visible light, ultraviolet light, and x-rays are all part of the **electromagnetic spectrum**. As the term radio wave implies, radio signals oscillate up and down much like waves in the ocean. How quickly a wave moves up and down is called **frequency**, and is measured in cycles (oscillations) per second or **Hertz (Hz)**. Kilohertz (kHz) and Megahertz (MHz) refer to thousands and millions of cycles per second, respectively, and are common units of radio wave frequencies. Another measure of a radio wave is **wavelength**, which is the distance between peaks of the wave. The higher the frequency, the shorter the wavelength. Radio waves are divided in segments or **bands**. Here are a few the ham community is most interested in:

MF—Medium Frequency–300 kHz–3 MHz

This includes the AM broadcast band 535–1605 kHz and the 160-meter ham band (1800–2000 kHz).

HF—High Frequency–3–30 MHz

This segment covers the 80/75-, 40-, 20-, 18-, 15-, 12-, and 10-meter bands. This is the most popular region for worldwide **DX**, or long-distance operation.

VHF—Very High Frequency–30–300 MHz

Our two bands on this are 2 meters (144–148 MHz), and 1.25 meters (220–225 MHz). The two meter band is just above the FM broadcast band. **Repeaters**, stations that receive and rebroadcast signals to allow broader area coverage, are extremely popular at these frequencies. The characteristics of VHF signals mean that communications are often limited to line of sight.

UHF—Ultra-High Frequency –300–3000 MHz

UHF communications are also limited in area coverage, and repeaters abound on the 70-cm (420–450 MHz) band. The 23-cm (1240–1300 MHz) band finds increasing use these days, but the 33-cm (902-928 MHz) band is virtually unpopulated throughout most of the country. Many hams enjoy satellite (**hamsat**) and amateur television (**ATV**) communications at these higher frequencies. Frequencies above 1000 MHz are generally called **microwave.**

Modes

Mode has many meanings, but here it is the method used to package information on a radio wave.

CW—Continuous Wave

Amateur radio's first mode of communication was continuous wave or CW, which was useful for Morse code. This wave is transmitted to produce a tone whose length can vary (''dits'' and ''dahs''), and shut off for spaces between tones. Morse code is still referred to by hams as CW.

AM—Amplitude Modulation

Our first voice mode.

FM—Frequency Modulation

The first hi-fidelity mode.

SSB—Single-Side Band

An AM signal has two sidebands, called Upper-Side Band, or **USB**, and Lower Side Band, or **LSB**. Both sidebands contain the same information. A clever way to save space on overcrowded frequencies is to use only one of the sidebands, but SSB equipment is more complicated than old, double sideband (DSB) AM radios. SSB development was a major advance in radio communications.

Digital Modes

Information in this mode is represented by discrete units, or ones and zeros. Read up on these in our Packet and RTTY Loop columns.

RTTY—Radio Teletype

RTTY sends characters as combinations of two tones. One tone represents ones, the other zeros. For example, the letter A is 11000, and B is 10011. RTTY is a more efficient and faster mode than CW, because tone combinations are machine-generated from keystrokes on a typewriter-like keyboard.

AMTOR—Amateur Teleprinting Over Radio

AMTOR is a special form of of RTTY that checks itself for errors that arise during transmission. It was introduced about 10 years ago.

Packet Radio

Packet is latest in amateur digital communications, and one of the most fascinating modes. Discrete ''packets'', or bursts, of information are sent back and forth between packet stations. Each packet contains a line of information, station to and from addresses, routing data, and error correction codes. The **protocol**, or method of coding within each packet, is also referred to as **AX.25**, an amateur implementation of a commercial system. Packet is convenient for computer-to-computer communications. Many hams set up bulletin boards (**BBS**) not unlike computer BBSs accessed on telephone lines. The radio modem that interfaces the computer with a transceiver is called a **TNC**, or Terminal Node Controller. TNCs are the radio equivalent to telephone modems. They take data from a computer, ''package'' it, and send it on to the transmitter.

Image Modes

These modes convey images. What follows are the three most popular in amateur radio. Look for more information on these modes in our ATV (Amateur Television) and in our Weathersats columns.

FSTV—Fast-Scan Television

This is the mode used to carry images to your TV screen. Hams have adapted this TV technology for their own needs and to see other operators that they have contact with. Color FSTV has recently become more popular.

SSTV—Slow-Scan Television

So named because it requires almost 9 seconds to scan and display an image on the CRT.

FAX—Facsimile

Similar to SSTV, except that the scan rate is much slower (1–2 lines/second).

''Q'' SIGNALS

The language of amateur radio is riddled with strange three-letter words beginning with ''Q''—you may have noticed that four of our monthly departments are titled with'em.

They first came into being in the code-only days to a way to reduce common questions and statements to a short code and make communications more efficient. ''Q'' was likely chosen as the first letter because it's the least common letter in the alphabet, and always always followed by ''U''—if it was followed by anything else, it was a sure bet that it was a code.

''Q'' signals can be either questions or statements. Here are the most common ones, followed by an example.:

QRL—''Are you busy? I am busy.'' Send this to see if a frequency is clear.

QRM—''Is my transmission interfered with? Your transmission is being interfered with.'' Often said ''Q-R-Mary'' to distinguish it from QRN.

QRN—''Are you troubled by static? I am being troubled by static.'' Often said ''Q-R-Nancy''.

QRP—''Shall I decrease power? Decrease power''. There are some hams devoted to elegance of low-power operation. Mike Bryce WB8VGE devotes his QRP column to them.

QSB—''Are my signals fading? My signals are fading'' Often said ''Q-S-Baker''. ''There's a lot of QSB on the band''

QSL—''Do you copy me, do you acknowledge? I copy, I acknowledge''. Hams exchange QSL cards to verify their contacts with each other. See ''QSL of the Month'' on page 6 for colorful and imaginative examples of these.

QSO—Conversation. ''Thanks for the QSO, Old Man''.

QSY—''Shall I change frequency? Change frequency.'' ''Let's QSY up 5 kHz.''

QTH—Location. ''My QTH is Peterborough, NH.''

QRX—''When will you call me again? I will call you at (hours) on (kHz).'' Our QRX column is devoted to Amateur Radio news.

QRT—''Shall I stop sending? Stop sending.'' ''The phone's ringing, I must QRT.''

JUST PLAIN JARGON

What's a language without fun words and endearments? Following is a list of a few of ours. (Again, most descend from the CW-only days).

DX—Long Distance.

On HF this could mean contacts outside a ham's own country, but on VHF/UHF DX could be the next county.

OM—Old Man

Man of any age.

YL''Young Lady''.

Unmarried woman of any age.

XYL''Ex Young Lady''. Wife.

Harmonics

Children of the OM and the XYL.

88s

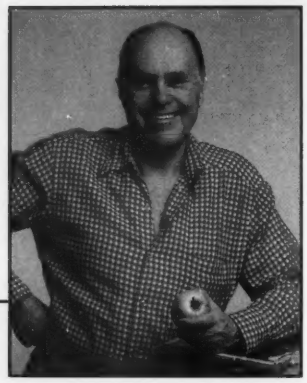
Hugs and kisses

And lastly . . .

73s—

the very best to you! Enjoy our magazine!

. . .de KA1HY



NEVER SAY DIE

Wayne Green

ROSIER PROSPECTS

Things are coming together for us—we're finally heading in the right direction. . . newcomers are up. After a 10% loss in newcomers per year for several years we're seeing a turn-around. No, I don't ascribe it all to the Archie comic book.

The critical element was the recent Novice voice breakthrough—and for two reasons. Obviously the idea of being able to enjoy ham repeater communications is attractive, even restricted to 220 MHz. But perhaps an overlooked aspect of this is the impact of the new regs on ham clubs. . . who suddenly have seen an indication that the FCC admits there's an emergency.

Of course, the FCC telegraphed their concern over the gradual dying of the hobby when they tried so hard to replace the code requirement with a more difficult technical test. Many amateurs ignored the technical aspect of the proposals and whipped up emotions in less-smart hams by crying that the CBers were coming.

I'm glad that the FCC didn't give up—even if they were responding more to the commotion over the threatened ham 220 loss than any serious interest in rebuilding our aging hobby.

My goading of ham clubs to get busy recruiting Novices has been having an effect. The Novice voice rules have given them a powerful tool—and they're using it. The League has also been voicing an increased concern—another prod to get clubs moving.

We have one other force helping us—the sun. With the sun spots increasing we're getting more and more openings on our higher bands—plus more hours of action on 20m. This has increased the general ham energy level, building up spirits. It's difficult to get all excited about a hobby where the crummy bands are dead most of the time.

A Serious Increase

So we're starting to see the first serious increase in Novices in years. Will we be able to keep it up? That's largely in the hands of our clubs. If they run Novice classes and get radio clubs going in their local schools, we'll see things improving.

One more powerful factor is at work. Fred Maia W5YI, together with Gordon West WB6NOA, have put out a Novice Voice Class package—booklet and tapes. The best part of it is they've gotten Radio Shack to list it in their catalog! That could get the product where millions will see it. It sure isn't going to hurt.

I tried a few years ago to interest Radio Shack in a similar project, but they didn't see amateur radio as having any prospects for growth then. Heck, they wouldn't even test the idea just to see if it would work. Let's hope it works out and Shack will continue to carry the product.

Culture Shock

If we really do start seeing youngsters showing up on our bands we're going to have some problems. I'm not talking a generation gap—we've got a double generation gap. Most of us are about 45 years older than the newcomers, so we're going to have some problems finding things to talk about.

Heck, I find I'm having problems—and I'm the same age as the average ham today. The difference is that I've chosen not to retire, so my interests are quite different. It seems to me that about 90% of the hams I find on the air today are retired—which is logical. The few who are still working are earning a living instead of operating. So the retirees, who can ham during most of their waking hours, are who's there.

How are you going to communicate with a 13 year old? At least twenty years ago you had some teenagers around the house, so

Continued on page 12

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

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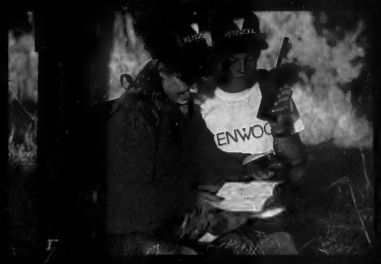
New 220 MHz

220: FM for All!



Kenwood brings you a wide range of 220 MHz gear designed for every need. Choose from two types of mobile and two types of HT. The TH-315A is a full-featured HT covering 220–225 MHz. Ten memory channels and 2.5 watts of power. (5 W with PB-1 or 12 V DC.) Uses the same accessories as the TH-215A for 2 meters or TH-415A 440 MHz. For truly "pocket portability," choose the TH-31BT, a thumb-wheel programmable, 1 watt unit. For mobile use, select the TM-321A or TM-3530A.

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TM-321A
Compact mobile transceiver

New

TH-31BT/31A
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220 MHz TM-321A Coming Soon!

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TM-221A/321A/421A

2 m and 70 cm FM compact mobile transceivers

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- **TM-221A provides 45 W, TM-321A, 25 W. The TM-421A is the first 35 W 70 cm mobile!** All three models have adjustable 5 W low power.
- **Selectable frequency steps** for quick and easy QSY.
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- **TM-321A covers 220-224.995 MHz. The TM-421A covers 438-449.995 MHz.**
- **Built-in front panel selection of 38 CTCSS tones.** TSU-5 programmable decoder optional.
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RC-10 Remote Controller

For TM-221A/321A/421A. Optional telephone-style handset remote controller RC-10 is specially designed for mobile convenience and safety. All front panel controls (except DC power and RF output selection) are controllable from the RC-10. One RC-10 can be attached to two transceivers with the optional PG-4G cable. When both transceivers are connected to the RC-10, **cross band, full duplex repeater** operation is possible. (A control operator is needed for repeater operation.)

Optional Accessories:

• **RC-10** Multi-function handset remote controller • **PG-4G** Extra control cable, allows TM-221A/TM-421A full duplex operation • **PS-50/PS-430** DC power supplies • **TSU-5** Programmable CTCSS decoder • **SW-100A** Compact SWR/power/volt meter (1.8-150 MHz) • **SW-100B** Compact SWR/power/volt meter (140-450 MHz) • **SW-200A** SWR/power meter (1.8-150 MHz) • **SW-200B** SWR/power meter (140-450 MHz) • **SWT-1** Compact 2 m antenna tuner (200 W PEP) • **SWT-2** Compact 70 cm antenna tuner (200 W PEP) • **SP-40** Compact mobile speaker • **SP-50B** Mobile speaker • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MC-55** (8-pin) Mobile mic. with gooseneck and time-out timer • **MA-4000** Dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mobile mount

Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

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QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

Congrats to KA9PMK!

David Rosenman KA9PMK received the 1987 Young Ham of the Year Award at the ARRL Southwestern Division Conference in Scottsdale, Arizona, on October 10th. The 16 year old Advanced Class licensee has been on the air since age 11. The precocious young man has devoted countless hours to public event communications support and recently served as aid de camp to US Olympic Committee President Robert Hemlick. David helped translate Spanish and Portuguese during the Pan American games in Indianapolis. He also speaks Italian and French. Westlink and Yaesu USA presented David with an FT-757 HF transceiver and power supply.

430–440 MHz Threat

The possibility of hams losing this spectrum hemisphere-wide looms. Vern Riportella WA2LQQ reports that Friday, September 25th, the representatives of the Mexican government at the 1987 Mobile Radio World Administrative Radio Conference in Geneva put forth a demand to reassign the current amateur radio spectrum from 430–440 MHz to land mobile use on an expedited basis. Mexico indicated it had strong support from other Central and South American nations, and noted that even if it were turned down by the WARC body as a whole, it may unilaterally make this reallocation. The US delegation was caught off-guard by the unexpected motion and spent the weekend attempting to rally support for the measure.

Ears to You

100 sight-handicapped radio stations throughout the USA are broadcasting special news, editorials, and programs as varied as the world itself, for the sightless, and anyone else with a reading disability.

This free service is operated almost entirely by volunteer readers. Special closed-circuit receivers are also furnished at no cost.

Anyone with a visual impairment may locate the reading service nearest them by writing to: the Association of Radio Reading Services, 1133 20th St. NW, Suite 250, Washington DC 20036.

Cocos-Keeling

Starting November 25th, 1987, F6GVD Hans, and G3AAV Victor will be QRV from Cocos-Keeling Island for 2 weeks. No specific time or frequency is available. The first 10 minutes of the hour operators will listen for QRP stations, and at the half-hour for handicapped operators.

The calls are VK9YH Hans and VK9YV Victor. QSL via QSL Manager VK9YC or direct to F6GVD.

Running Dogs' Choice

Several new mainland Chinese stations are reported on the air. BY1CKJ says to QSL to Box 6206, Beijing, Peoples' Republic of China. Also, BY5RT gives Box 707, Fuzhou, Peoples' Republic of China, as his QSL route. Finally, BY2HIC has been heard on 14.028 MHz at 0326 with an operator named Wendy at the station controls.

GMT Dying

The six atomic clocks at Britain's oldest scientific institution, the Royal Greenwich Observatory, are running down. The observatory that gave the world GMT, marked the Prime Meridian, and became the ultimate reference point for anyone setting a precision timepiece will be forced—312 years after its inception–to ask others what time it is.

Le Bureau International de l'Heure (International Time Bureau) in Paris will become the new standard, after the Greenwich clocks tick their last.

Mobile Op Illegal?

In 1937, the Minnesota Legislature passed a law prohibiting radios in cars that could copy police and emergency service transmissions. It is still on the books, which means any mobile amateur in this state could be subject to arrest due to the wide frequency coverage of current rigs.

Hams organized a movement to change this law, and a bill is now working through the legislature to make it legal for hams to have that receiving ability, provided:

- Convicted felons wait 10 years after their sentence expiration to use such a radio.
- Such radios must be under the direct control of licensed amateurs. No unlicensed persons can operate these rigs, even to receive.

This example can serve as a model for amateurs in states that still have such outmoded laws on the books.

Western Sahara

The Lynx group launched a joint project with the Saharan Arab Democratic Republic (R.A.S.D.) authorities two years ago with the aim to establish amateur radio in this country. The R.A.S.D., formerly the Spanish Sahara, is located on Africa's northwest coast. The project was finalized in September, and is expected to be carried out soon. They will enter the R.A.S.D. from Algeria.

Heard Is. Reheard

Dan Shaw VK3DHF/VK0HI has returned to this rare DX spot for another 6-month stint.

Aussie Novice 2m Phone?

A proposal generated at the 1987 Federal Convention to give Australian Novices phone privileges on the entire 2-meter band received full support from Federal Councillors from all divisions except VK1. Apart from providing Novices more incentive, it arose from two considerations:

- To give a common band for Australian pan-license Class communications.
- To accomodate the recent VJ/JA reciprocal licensing agreement. Japan has a long-standing amateur Telephone-only license grade with VHF operating privileges and a no-code proficiency exam. Australia still has no no-code license class.

Despite nearly unanimous support, this proposal was ignored at the Convention and so may have to wait for another year.

Miami Pope Visit

A Miami Radio Club coordinated communications for the recent visit of Pope John Paul II to that city. The Miami Archdiocese selected the Sociedad Internacional De Radio Aficionados to organize and plan the communications for the Pope's visit to Miami on September 10–11.

SIRA Prez Rafael Estevez WA4ZZG took an unpaid leave of absence from work and worked around the clock for the last four weeks to prepare for the Pope's arrival. He trained personnel and volunteers to operate 115 hand-held and 3 base station commercial radio units. Dubbed "Operation Omnidirectional," the Miami Papal network used a pair of commercial UHF repeaters, and several UHF and VHF simplex channels. Other hams and secret frequencies were in reserve for emergency situations.

Thanks to . . .

Westlink, TSRAC Bulletin, Delaware-Lehigh ARC News, W3PYF, VK3YJ, W4ATE, and VE3JPP for this month's news items. Keep'em coming to: 73 Magazine, WGE Center, 70 Rt. 202N, Peterborough, NH 03458-1194, Attn: QRX

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Kenwood: from Novice

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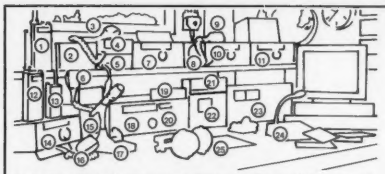

1) TH-315A: 220 MHz Hand-held Transceiver; **2) PS-50:** DC Power Supply; **(3) MC-43S:** UP/DWN Microphone, included with **(4) TM-2530A:** Deluxe 25W,2m FM Transceiver; **(5) TM-3530A:** Deluxe 25W,220 MHz Transceiver (also comes with MC-43S mic.); **(6) MC-48B:** 16-key DTMF Microphone; **(7) R-5000:** High Performance Receiver; **(8) SP-430:** Matching External Speaker for TS-430S/TS-440S; **(9) MC-48B;** **(10) TS-711A:** 2m, 25W, All Mode Base Transceiver; **(11) TS-811A:** 70cm, 25W, All Mode Base Transceiver; **(12) TH-215A:** 2m, Full-featured HT; **(13) TH-21BT:** Pocket-sized, 2m FM Transceiver; **(14) TS-440S:** HF Transceiver (with AT-440 installed); **(15) SP-940:** Matching External Speaker for TS-940S; **(16) MC-48B;** **(17) MC-60A:** Base Station Microphone with UP/DWN controls; **(18) TS-940S:** Competition Class HF Transceiver with General Coverage Receiver (AT-940 installed); **(19) IF-232C:** Computer Interface Level Translator; **(20) IF-10B:** Computer Interface Module (installed inside TS-940S); **(21) SW-2000:** SWR/Power Meter; **(22) SM-220:** Station Monitor with pan display option BS-8 installed; **(23) TL-922A:** HF Linear Amplifier; **(24) MC-85:** Multi-function Desk Microphone with Graphic Equalization and three outputs; **(25) HS-5:** Deluxe Headphones.

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

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NEVER SAY DIE

from page 6

you weren't completely out of touch. My youngest daughter is 17 now, so I have an idea of what you're up against.

Their world is school, dates, sports, rock music . . . while yours is golf, picnics, 807s and TV. Great mix. It doesn't even help having been through the woods before, because most teenagers are convinced they know more than we do and don't want to hear about it. Kennedy and Lincoln were assassinated presidents—history. Lucy? Who's Lucy?

It's going to be difficult, and we're going to need some help. Let's not fight it because these Novices are our ticket to holding our frequencies. No matter how difficult, treat 'em right . . . make 'em welcome. Get 'em to your club and see that they have fun. There's no way you'll be able to give them too much attention. Invite 'em to your shack. If you've got a big signal, let 'em enjoy talking to some DX.

Due to the usual absurdity of government regulations you can let a pre-Novice operate your station while you are "in control"—like sitting nearby. But a Novice can only operate in the bands he's licensed to use. Great, eh? You can let 'em talk, but you have to switch. Your mother, if she isn't licensed, can operate the switch. No, don't ask me about the VOX . . . and please don't ask the FCC either. Just go ahead and shut up.

The FCC will let you do almost anything you want that isn't actually prohibited—unless you ask. Then their normal response is to prohibit it. That's the only safe move for career bureaucrats.

73 GROWTH

Let's see—outside of the hams who are mad at me for wanting to substitute a tougher technical exam for the code—those who are mad at me for wanting to increase the code speed—those who are mad at me for criticizing the ARRL—those who are furious with me for supporting ARRL—those who hate me for being pro or con on a hundred subjects—yes, outside of that majority, *73* has been growing faster than it ever has in the past. Not that many readers know where I actually stand on many things because I can argue heatedly either way—and do.

Finding younger hams for the *73* staff has been very difficult. When I first moved to Peterborough 25 years ago I had no problem in attracting a whole bunch of young college dropout hams. We had a ball, living in my 40-room old house with me cooking the meals. But with so few young hams today, there's almost no one interested in making amateur radio their career.

Well, if I can't find young hams to work in my hamshack testing new gear as it comes out, perhaps you'll lend a hand. Whenever you buy a new piece of ham gear I wish you'd check it out for a few weeks and then write and let me know what you think of it. I'm not so much interested in lab measurements as your objective experience.

Let me know how easy it was to set up and use. How are the controls? Are they easy to use? Are some missing? Are some superfluous? How about the quality of construction? If you have any problems, how's their customer service? Perhaps you've made some changes . . . what and why? If you'll let me know how the gear is working for you, I'll pass it along in *73* so we can all benefit from your good or bad experiences.

Maybe you've finally gotten active on packet and would like to tell everybody what fun you're having. I'd love to have several letters a month from readers who've tried new ham interests and are fired up about 'em.

We'll be looking for hams who can write to help us test out new gear. No, you don't get to keep it—all you get is the fun, the fame and a few bucks to keep your wife quiet. I don't want there to be any ham gear on the market which hasn't been reviewed in *73*. Heck, I want to know as much as you do how something new works.

Speaking of new, we've got my new hamshack perking. When we moved *73* from Peterborough five miles up to Hancock I had to start over. We've a nice tower and a massive Sommer antenna—driven by the ICOM 761. Now and then someone gets through to rare DX before I do, but not often. The first day I got it on the air I worked five HLs for the Worked All Seoul certificate (WAS). What a delight to call someone and know he's going to come back.

There's no way I can put in the hamming hours I'd like, not with five other publications—plus some other small businesses. So I need help in getting my hamshack set up for OSCAR, active on packet, more functions on my repeater, and so on. Find ham help today? It isn't easy. I'd love to hear from anyone who might be interested.

ASPEN HAMFESTETTE

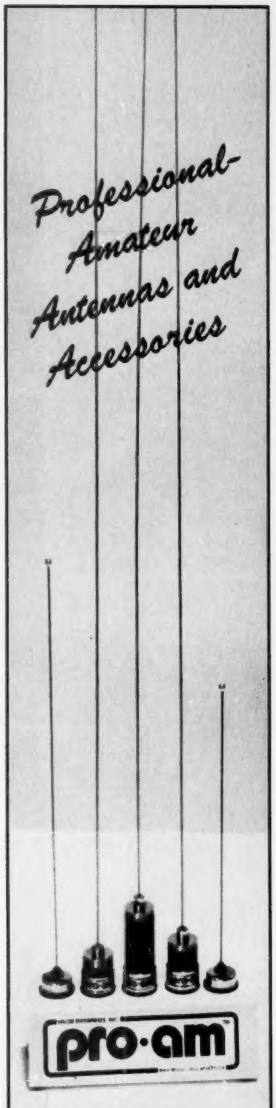
You a skier? Doing anything special in January? If I've got a yes-no on that pair, there's a group of us who get out to Colorado the second week of January most every year and burn up the slopes and the Aspen repeater, HTs in hand.

This got started as a small ham industry meeting back in 1976 providing a medium for a few manufacturers and dealers to get together to talk about hobby and industry problems. Local and vacationing hams joined in, so now it's just a general ham skiing week in Aspen.

We not only have a ball on the slopes, the apres-ski is fun, too, with group dinners at different restaurants every night.

For some reason the second week of January usually finds Aspen almost deserted, so there are no lift lines and no problems getting seats in restaurants. Let me know if you think you can make it. Yes, there'll be some wives . . . and the skiing skills range goes from bunny to gung-ho. I'm a fast intermediate, but slowing down as my old bones get brittler. 73

"How are you going to communicate with a 13 year old?"



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CIRCLE 290 ON READER SERVICE CARD

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Kenwood TH-215 Handheld

High-Class Hand-Held Hamming

No matter how many times you look at or think about today's equipment, one fact becomes clear: It's amazing how much manufacturers are cramming into smaller and smaller spaces. For example, the Kenwood TH-215A two-meter transceiver packs a lot more wallop than the handheld it replaced (the 2600) more than a year ago—in a package that's the same size. In fact, the TH-215A corrects many of the things that I find somewhat troublesome on my own TR-2600A.

Great Stuff!

Take the squelch, for instance. On the TR-2600A, Kenwood combined the squelch and volume controls into one position, rather than two. The manufacturer did this by using concentric controls, one shorter than the other. The only problem is that many times when you turn off the 2600, you open the squelch and that can be a shock when you're not expecting it. On the 215, the squelch and volume controls are in two positions, as they were on the older Kenwood TR-2500A, which preceded both the 2600A and 215A.

Another area that Kenwood improved upon is the liquid crystal display. On the 2600A, it is small but usable, and there is really no easily distinguishable way to determine the mode your rig is in—carrier-operated squelch for scan or priority mode, for example. Yes, there are indicators in the display, but they are small (a C for carrier-operated squelch) and easy to miss in the display. On the 215A, the display shows not only if the rig is in priority, but there is also a clear indication of the rig's mode in an easily visible grid at the bottom of the display.

Another interesting feature of the 215A is its multiple tone capability. Instead of registering command entry into the microprocessor-controlled handheld with simple tones as was the case on the 2600A, you now have a range of tones which indicate an action has taken place. Each action seems to have a different sequence of tones, which is a good reinforcement if you have doubts that the action you wanted really happened.

Still another improvement is the scan rate. Like the 2600A, the TH-215A has 10 memories and offsets are stored for each memory, as well as any subaudible tone which may be needed. On the 2600A, there was no built-in range of subaudible tones. Instead, you had to buy a separate module to activate any tones. It's a nice improvement and should be welcomed by those operators who need this feature.

Another improvement for those who like to monitor many repeaters is a higher-speed scan rate for the 215A. Where the 2600A improved on the older 2500, the 215A rockets past the 2600A. The scan rate seems on the order of about 8 to 10 memories a second, which means that you'll seldom miss a conversation, unless you have the carrier-operated squelch feature activated. If the carrier-operated scan feature is activated, then you'll find the rig stays with one QSO until it's over and then moves on when the tail drops.

The List Goes On

The list of improvements goes on and on, but here's a look at some of the other key changes: signal strength meter is now part of the LCD, rather than at the top of the rig as on the 2600A; the keypad is smaller and uses soft-feel rubber keys which should last for a while; the reverse switch is on the front of the rig instead of the top; the offset switch is also on the front, instead of the top, and the enter key is plainly labeled. Also, the keyboard lock and transmit lock functions are no longer separate and on the side of the rig where it's easy to forget them. Instead, they are on the keypad, too.

With the number of functions that have been included on the front of the rig and with the ease of access, it's quite evident that Kenwood is finally realizing that many handhelds are used in place of mobile rigs, especially when you consider that most handhelds are now capable of three to five watts of output.

The TH-215A falls into the five-watt category. Using a lightweight metal (magnesium, probably) rear case as the heatsink, the TH-215A is capable of five watts of output when 13.8 VDC is applied to the rig.

Another feature surely everyone will like is the 215A's extended receive capbility. It receives from about 141 to 163 MHz, which makes this rig useful for those people who want to listen to public service frequencies or the National Oceanic and Atmospheric Administration's broadcasts in the 162 MHz range. Of course, this is also a bow to competitive pressures because other rigs have had this feature for a long time.

Some other interesting features of this rig include the ability to store odd offsets in memory 10; a battery saver which extended battery life; a tone squelch setting which works in conjunction with the built-in tones capability; memory lockout to skip over unwanted frequencies, and the multifunctional display.

Number 12 on your Feedback card

Photo A. The Kenwood TH 215A Handheld.

This package also comes with some good specifications. For example, it has three output levels, about 200 mA on low power, 2.5 watts on high power with the battery, and five watts with 13.8 Vdc; maximum deviation is preset at the factory at 5 kHz; sensitivity of less than 0.2 uV; squelch sensitivity of 0.16 uV; selectivity of more than 12 kHz at -6 dB and less than 24 kHz at -40 dB, and 350 mW of audio, which is more than adequate in most situations.

Swapping Accessories

If you are in the market for this rig be aware of several things. First, unlike other, older handheld series that Kenwood has manufactured, the TH-215A has nothing in common with its predecessors. For example, I can use 2500A accessories with the 2600A and vice versa. But, I can't use anything more than the speaker-microphone of the 2600A with the TH-215A.

Also, the batteries have changed with Kenwood opting for the Motorola style twist on battery. So, where some people may have had problems with rails breaking on the older plastic battery cases, especially when the battery dropped, it is likely other people will have

problems with the two plastic retaining tabs which extended from the base of the TH-215A. This is only a observation, rather than an empirical result from prolonged testing. It is more than likely that people will use this rig for years with no problem.

If you plan to use the five-watt capability when you're driving, be aware that the metal case becomes quite hot to the touch and if you lay it on plastic, it is conceivable you may mar the plastic with the rig. Be sure to keep it so that air circulates freely around the handheld.

Finally, where Kenwood's documentation used to have a few problems, the instruction manual they send with the TH-215A is barely understandable and other than providing a semblance of an idea of what each function does and how to do it, you can probably figure out each function yourself about as quickly. It also omits certain things, evidently assuming that hams are little more than appliance operators. One of the key items that is missing is how to wire up a speaker-microphone or headset of your own. It's nowhere to be found, although you are told how to wire up the 13.8 VDC plug.

Overall, the Kenwood TH-215A is a worthy replacement for the 2600A. It's worth a look and, in fact, if I was in the market for a handheld today, I'd probably opt for this one. 73

The Kenwood TH-205AT Two-Meter Handheld

Number 13 on your Feedback card

by Larry Ledlow, Jr. NA5E

Kenwood USA Corp.
2201 E. Dominguez St.
Long Beach CA 90810
Price: $260

Good Heavens! Good Value!

These days hams shopping for a handheld FM transceiver face some difficult choices. The TH-205AT/A/E models are Kenwood's answer to shoppers looking for a functional two-meter rig without a lot of complicated or expensive features they don't intend to use. Kenwood introduced the TH-205 and its 70cm sister TH-405 to satisfy those frugal hams who want good value in a hand-held radio.

A Nice Package

The TH-205 is a standard-sized handheld. The transceiver module (without the battery pack) matches the dimensions of an ICOM IC-2AT. The supplied PB-2 makes the Kenwood about ½ inch taller than the IC-2AT with its standard BP-3 battery pack. Specifically, the TH-205 measures 2 ¾" x 7 ⅛" x 1 ½" and weighs approximately 19 ounces with the NiCd battery pack and antenna. Fashion-conscious hams will no doubt rejoice to find the rig's tasteful black and gray color scheme matches most any shack accessory. This attractive package features two watts output with the supplied PB-2 and five watts output with the PB-1 battery pack. The USA version also comes with a DC cable to operate from any 13.8-volt source to get 5 watts output. Low power output is approximately 500 milliwatts.

The suffix AT designates the model equipped with a 16-button DTMF keypad. Other features and controls common to both TH-205 and TH-405 radios include up/down tuning keys; three memory buttons; scan, offset select (±/simplex), and display lamp keys; frequency lock switch; and a multipurpose LCD readout with frequency, offset, battery status, ON AIR, and channel BUSY indicators. The rig accepts 7.2–16 VDC in a receptacle adjacent to the BNC antenna connector. It also has receptacles for an external speaker and a microphone. The TONE switch atop the rig activates a subaudible tone encoder. Selective hams who won't let just anyone break their squelch will find the optional TSU-3 CTCSS tone squelch unit absolutely essential. The TSU-3 prevents the squelch opening unless the received signal contains the appropriate tone.

On the Air

Off the shelf, the TH-205AT receives from 141.000 to 162.995 MHz and transmits from 142.000 to 148.995 MHz. The user tunes frequencies with the up/down buttons in 5-kHz steps. Depressing the tune buttons for longer than a second will cause the unit to tune quickly, somewhat greater than 3 MHz per minute. The fastest frequency change strategy is to select the memory channel nearest the desired operating frequency followed by fast tuning from the keyboard. The repeater offset is fixed at ± 600 kHz.

Reactance modulation produces the frequency deviation for the transceiver. Several hours of on-the-air tests proved the rig worked well with favorable reports of transmitted signal quality. Audio quality from the small speaker is average and unsurprising, since the output is approximately 350 milliwatts across 8 ohms and with 10% distortion. Noisy environments would require an external speaker or headset. All handhelds suffer from this deficiency.

The final power amplifier unit uses the back panel of the rig as a heat sink. This panel becomes noticeably warm after even short contacts. The operating manual carries a worrisome warning to keep the back panel away from plastic or vinyl surfaces when operating in the 5-watt mode for long periods. Installation of the metallic belt loop on the back panel should help dissipate the heat more efficiently.

Kenwood rates the supplied PB-2 at 8.4 volts and 500 mAh. This gives the user about an hour operating time in the high power mode. This rating assumes a duty cycle of one minute transmissions followed by three minutes reception. As usual, the NiCd pack gives very little warning of impending depletion, and the BATT warning indicator on the LCD serves a useful purpose. The TH-205 uses a battery saver function, which turns a number of functions off after one minute idle time. The receiver reactivates when it detects a signal. Lithium batteries maintain memory and VFO settings while changing battery packs.

The three memories retain frequency and offset information. Two keystrokes enter a frequency into memory from the main VFO, and one keystroke recalls the memory information. The memory recall buttons actually toggle between the selected memory and the previous selection, whether it was the main VFO or another memory.

The user initiates scanning on the TH-205 by depressing the SCAN button. Only full-band scanning is available, and pressing an up/down tune button determines the direction of scan. The scan stops on a busy channel and does not resume until the user presses the scan button again. The scan rate is slightly less than the fast tune rate. I measured 2.9 MHz per minute. The radio will not scan its memories.

Several other features are worth noting. A MONITOR button above the PTT switch temporarily opens the squelch and allows the user to quickly check the channel for activity. This prevents fumbling with the squelch level setting to check for weak signals. The DTMF saves a little work, too. The rig will remain in transmit mode for two seconds after the PTT and first DTMF button are depressed. Each subsequent press of a DTMF key also activates the transmitter for two seconds. Therefore, the user can release the PTT and complete the dialing with very little hand coordination. Users with certain physical handicaps may really appreciate these features.

A Winner!

The TH-205AT represents good value. In today's ham market, all hand-held FM transceivers command respectable prices. Price-conscious operators who are looking for a basic HT will find the TH-205AT more than adequate. Although a simple rig, the TH-205 offers a few nice features without adding a few hundred dollars to its price. Kenwood has a winner here. 73

TH-205AT Specifications

Frequency Coverage:	141.000–162.995 MHz RX 142.000–148.995 MHz TX
Power Requirements:	6.3–15 VDC Battery Pack 7.2–16 VDC External DC
Power Output:	5 watts (with PB-1 or external DC) 2 watts (with standard PB-2) 500 mW (low power)
Receiver:	Double-conversion superheterodyne 30.825 MHz first IF 455 kHz second IF
Sensitivity:	Less than 0.25 µV for 12 dB SINAD
Selectivity:	More than 12 kHz at -6 dB Less than 28 kHz at -40 dB

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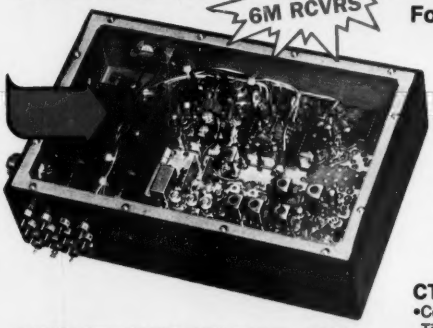

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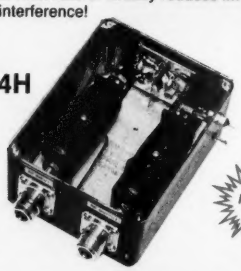

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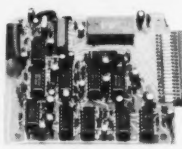

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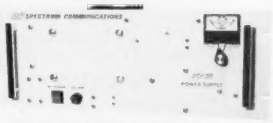

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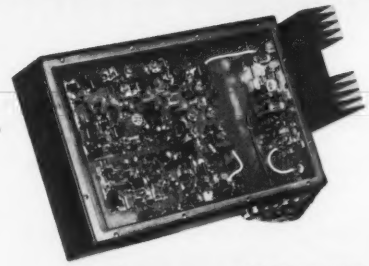

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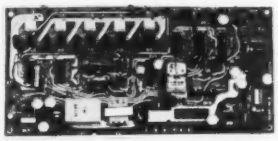

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73 Review

Number 14 on your Feedback card

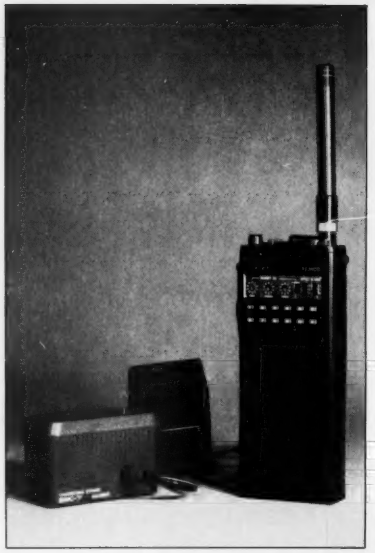
by Bryan Hastings KA1HY

Alinco ALX-2T 2-Meter Handheld

Small and Simple

Alinco Electronics, Inc.
20705 S. Western Ave., Suite 104
Torrance CA 90501

Price Class: $250 (AC Charger, DC drop-in Charger, Tone Board, and EBP-3N 450-mAh Battery Pack)



The Alinco ALX-2T with charging stand and AC adaptor.

Hand-helds—amateur personal communication devices—have quickly evolved in the past 10 years, and the obvious trend was to make them smaller and pack more features in them. HTs became so over-featured, however, that soon hams demanded one with fewer frills and made easier to operate. The ALX-series HTs from Alinco, their first mini line, are such rigs.

They have been on the market only since mid-October. I spotted the 2-m prototype down at the Atlanta Hamvention in July, and 220- and 440-MHz versions are also on the market. At the time I received the 2T for review, the tone boards weren't yet available.

ALX Features

The features are *basic*. The frequency is thumbwheel-set on the top panel of the rig, with three thumbwheels for the 1-MHz, 100-kHz, and 10-kHz digits. The 5-kHz offset is set with a pushbutton, also located on the top panel. You cannot set a non-standard offset frequency.

The on/off/volume switch is adjustable, but the squelch isn't. A three-contact jack for an external mike and speaker is between the volume and squelch. To open the squelch, press its button on the top panel and keep it pressed for as long as you want it open. There is a similar switch for the lamp, which glows soft green and changes to red in the transmit mode. There is only *one* memory.

The only "scan" feature is the priority switch, which allows the unit to monitor the alternate channel. There is a pushbutton on the top panel for dial and memory mode, and one for encoding a 1750-Hz tone. This tone is found only on the European version (2E) of this HT, since many European repeaters require this tone for access. The memory channel has its own 5-kHz offset switch, but the dial and memory channels share the single repeater offset control.

The keyboard on the front panel has only the numeric keys and the star and hatch, for autopatching. The DTMF tones are not user-audible.

The transceiver also has a battery-save function, set by a slide switch on the front panel. Battery save lowers receive-mode current to a third of the normal setting. You can set the rig to battery save-high power, battery save-low power, or high power without the save.

Operating Impressions

I had no trouble assembling the rig except for a sticky battery pack. The antenna connectors are unusual. They are threaded and resemble RCA phone connectors. The audio is acceptable.

Its big advantage is portability. I reviewed the rig with the 450-mAh battery pack (EBP-3N), which weighs only 12 ounces and has dimensions very close to the ICOM μ2-AT. With the smallest pack, the 2N, total unit weight is only 9½ ounces, putting it under the Kenwood minis in size and weight.

Now for the disadvantages. Bear in mind that these are *ergonomic* comments only, and don't reflect on the electronic integrity of the rig. Some operators may not even see them as problems.

The biggest drawback is the difficult-to-dial single memory channel. It's set with three recessed dials on the front panel that correspond to the 1-MHz, 100-kHz, and 10-kHz digits, and require a flat-edge blade, similar to that on a jeweller's screwdriver, to adjust. You are also required to carry this special tool, though Alinco provides it on the carrying strap. These controls are stiff, and in the half-dozen times that I reset the memory frequency, the soft plastic around the dial groove began to wear a bit.

The priority function samples the alternate channel at three-second intervals and emits a tone when the alternate channel is busy. Its two distractions are the raspy screech of this tone, and the stuttering effect due to the selected channel audio dropping out during the sampling cycle. This stuttering is a feature common to most rigs with priority channel scanning.

The thumbwheels for dialing the main channel require nimble fingers. They are flanked from the top by the protruding dial lamp, on the right by the antenna connector, and on the bottom by a small protrusion. It can be difficult to crank the wheels toward the lamp. In the same vein, the keypad keys are also very small, not widely spaced, and have modest detent.

Accessories

There are four battery packs available, which permit power outputs from two to four watts and from 30 to 90 minutes of operation time. This HT came with the 450-mHa battery pack, and a charging stand that accepts either 110 VAC or 12 VDC with the AC and cigarette-lighter adaptors.

Conclusions

Bear in mind your particular circumstances when considering this rig. Are you looking for a pocket-sized rig to satisfy your basic communications needs? This rig is one of the lowest priced units available. The ALX-2T, one of the smallest and lightest HTs on the market, is a big contender in today's heavyweight HT market. 73

ALX-2T Specifications

GENERAL	
Frequency Range	144–147.995 MHz (2T)
Operating Temperature	−10°C to +60°C
Power Supply	Receive Requirement
	Batt. Save ON 25 mA
	Batt. Save OFF 8 mA
	Transmit
	High (2 W) 750 mA
	Low (400 mW) 350 mW
Dimensions	58 (W) x 141 (W) x 23 (D) mm
(including projections)	66 (W) x 151 (H) x 28 (D) mm
Weight	240 g
TX Section	
Power Out	2.0 W/400 mW (7.2 V)
Modulation System	Reactance Modulation
Max. Freq. Deviation	±5 kHz
Unwanted Reflection	Less than −60 dB
RX Section	
Sensitivity	12 dB SINAD, less than 0.25 μV
	S/N more than 26 dB at 0.5 μV input
Squelch Sensitivity	Less than 0.25μV
Selectivity	More than ±7.5 kHz at −6 dB
	Less than ±15 kHz at −60 dB
AF Output	More than 200 mW (8Ω load, 10% distortion)

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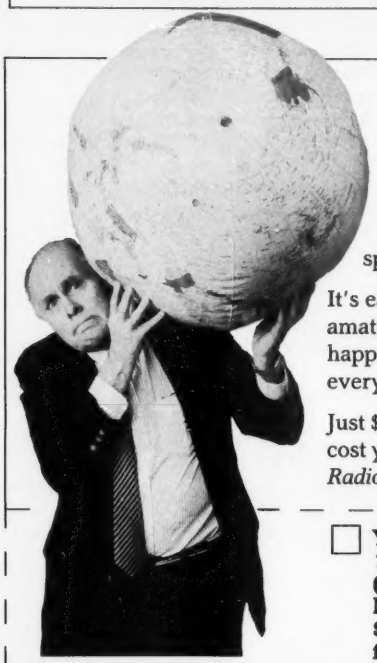

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ICOM's Classic IC-2AT: The Most Popular Hand-Held of All Time

The IC-2AT has left an indelible mark on the amateur radio world since 1979.

"Step right up, folks. Don't be shy! Look at this little beauty. I'm telling you, it's a marvel of construction, full of features and easy to use. Small enough to fit in your pocket, too. Best of all, it costs only two hundred thirty dollars. At that price, you'll want two of 'em! Hurry...hurry." Snake oil? Nope. Just amateur radio's equivalent to the Model T: The ICOM IC-2AT hand-held, perhaps the most popular and enduring transceiver of all time.

Since it burst onto the scene in December, 1979, over 500,000 units have been sold world-wide according to ICOM America. It's been manufactured in several versions depending on the country of destination, and has spawned a wealth of aftermarket accessories ranging from quick-charge adapters to drop-in mobile docking boosters. The IC-2AT also single-handedly created a strong market for hand-held amplifiers, typically running 25-35 watts output for 1-2 watts drive.

73 readers first found out about this little marvel in the May, 1980, issue which featured a full-page advertisement with a life-size photograph. The copy read, "When Is ICOM Coming Out With a Hand-Held?" and below the transceiver was the reply: "The Answer Is: Now!". This sent thousands of hams to their phones, charge cards clutched in one hand while dialing with the other. Initial orders overwhelmed dealers! The IC-2AT pioneered a number of features commonly found on HTs today. It was the world's first synthesized hand-held to use both thumbwheel encoding and detachable battery packs. It also offered a range of these packs for various charge rates and output power levels. This approach kept downtime to an absolute minimum. Other hand-

ICOM's IC-2AT

helds on the market couldn't be used while charging. ICOM also forced the rest of the industry to standardize BNC antenna connectors.

Frequent visitors to hamfests will remember a long period in the early '80s when hamfest organizers didn't have to advertise the door prize: an IC-2AT, of course. Many lucky winners went home with a second unit to back up their initial purchase of this HT. Some wound up with three and even four! In one case, the winner actually refused the prize and negotiated to get the second prize (an antenna tuner). Failing that, he accepted and turned the 2AT into ready cash at a bargain price, which he then spent on the desired tuner. When asked why, he replied "I sure don't need four 2-meter hand-helds."

The First Runners

The first modifications for IC2A/2AT series radios made their appearance in the July, 1981, issue of *73*, and (wouldn't you know it) they detailed the installation of a non-standard offset, using an extra CD4051 IC and a few crystals to do the trick. ICOM by this time had announced 10 accessories for the line, including 5 different battery packs. VoCom had come out with a neat little 2-meter amplifier that produced 30 watts with as little as 200 MW of drive—perfect for IC-2AT mobiling. A number of small enterprises introduced battery eliminators for use in the car or base station, perhaps fueled at the time by a shortage of the official ICOM factory version. Subsequently, an article in the August, 1981, issue of *73* detailed a way to roll your own accessories for the IC-2AT, specifically a PTT microphone, trickle charger and the use of a K-Mart 110 camera case to protect the hand-held.

By this time, both Yaesu and Kenwood were into their second generation of synthesized hand-helds, and Santec had jumped into the market to compete with ICOM. No problem, as ICOM stole the march on everyone by announcing the IC-3AT for 220 MHz

in December, 1981, and promptly sent every 220 enthusiast running to the phone with credit card clutched in one hand as they frantically dialed with the other. More companies came out with accessory amplifiers and 5/8 wave base-loaded antennas as the hand-held market in general was heating up.

For most purchasers, the IC-2AT (or -2A, without the DTMF option) became an indispensable companion rivalling the family dog. IC-2ATs went to plane flights, ocean cruises, family outings, in hot air balloons, hiking, camping, skiing and bicycling. For the travelling ham, the rig proved indispensable.

One climber took an IC-2AT up Mt. McKinley to communicate with a base station many miles distant. Scott Nelson, W7KUF, told this dramatic tale in the January, 1982, of *73* and detailed the climb of North America's highest peak with members of his Snowbird Expedition. He chose the IC-2AT because it was small, easy to use and didn't drain the batteries to operate such things as a display and other bells and whistles. His choice paid off during a very real emergency on the climb: The IC-2AT was pressed into service to request an airlift for an injured climber.

In May, 1982, ICOM advertised the IC-4AT, sending the usual 440 MHz FM enthusiasts flying to the telephones clutching credit cards. More modifications had appeared by this time, including several conversions to MARS and CAP frequencies. Other manufacturers lowered their prices to compete with the IC-2AT, which hovered about the $230 range but could be had for closer to $210 with judicious shopping.

The years followed with innumerable modifications to batteries, frequency coverage, DC supplies and all kinds of wacko portable antenna designs for portable use. Other manufacturers continued to evolve new generations of hand-helds (and many of them adopted the slide-on battery pack system pioneered by ICOM) with more bells and whistles than ever before. The IC-2AT? It continued to sell at a steady pace, as did the IC-3AT and -4AT versions. But pressure was building on ICOM to come up with a comparable whiz-bang answer to their competitors.

"The IC-2AT became an indispensable companion rivalling the family dog."

Updating a Standard

So the answer came in 1984, with the IC-02AT and IC-04AT series radios, with scanning, memory storage and a backlit LCD display. Additional accessories were introduced, among them a VOX headset and a high-current battery pack. Many of the new accessories were interchangeable with the older IC-2AT/3AT/4AT series, however. ICOM had no intention of replacing the Volkswagen Beetle of HTs!

Today, eight years after the unit's introduction, the picture is pretty much the same. The product line has added 23 cm in the form of the IC-12AT, but the IC-2AT continues to chug along, albeit at a somewhat higher price. And it can't claim to be the most popular grand prize at hamfests anymore (to the relief of owners with 7 or 8 units).

And the survival tales are still told of the legendary endurance of the tough case and innards: drops from 70-foot towers; dives into a pool, retrieval, drying in an oven and springing back to life; flights out of a car window or door at 30 mph, hitting the ground and squawking back to life with a new battery pack. I can personally testify to the ruggedness of the IC-2AT. After a fall and slide down a ski slope for 100 feet on top of one, buried about a foot under the snow, I rescued the battery pack, switched it on and heard a nearby repeater—as if nothing had happened.

Yes, the IC-2AT has certainly left its mark on the amateur radio world over the past few years and will continue as an industry standard. *73*

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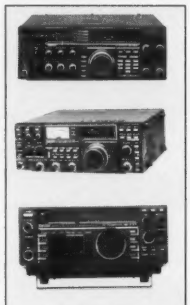

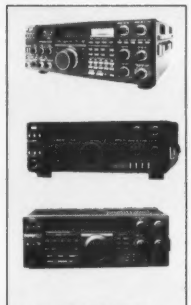

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FT-109RH	220 HT/5w/scanning/memories	379.95	319.95
FT-209RH	2m HT/5w/scanning/memories	379.95	319.95
FT-709RH	440 HT/5w/scanning/memories	379.95	319.95
FT-23R	Mini 2m H.I./DTMF	299.95	259.95
FT-73R	Mini 440 HT/DTMF	314.95	279.95
FT-211RH	2m 45w autodialer mobile	459.95	399.95
FT-311RM	220 25w version FT-211RH	439.95	384.95
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CIRCLE 162 ON READER SERVICE CARD

Larry R. Antonuk WB9RRT
Technical Editor

Number 8 on your Feedback card

ICOM BP-4 Charging Adapter

Our own technical editor beats the system.

Practically every ham radio operator, and certainly everyone involved with electronics, has at one time or another experienced a feeling of absolute despair. The despair usually occurs right after the project you just built fails to work, or when that puff of creamy smoke comes out of your month-old rig, or as you watch your new tribander slowly drive itself through the garage roof. The feeling usually is a combination of extreme frustration, confusion, and sadness, followed by the realization that there really is no governing force in the universe. Physical symptoms that accompany these feelings include long sighs, drooping shoulders, poor posture, and a knot in the abdominal region.

Photo A. The WB9RRT el-cheapo IC-BP4 charger adapter, inserted under the rails of the battery pack. See Figure 1 for foil layout on board bottom.

A Serious Deficiency

Not having experienced any of the above situations recently, I had been feeling quite immune to any feelings of hopelessness. This all changed with the purchase of a simple battery pack for my IC-2AT. My original battery pack was getting a little weak, and I knew it was time for a replacement. After pricing new battery packs, it occurred to me that I could buy the empty BP-4 pack, fill it with slightly used NiCds that I could get for free at work, and have a perfectly good battery—all for only $15.25. I bought the BP-4 pack at the next hamfest.

A few days later I brought home some NiCds, secure in the knowledge that I was advancing ham ingenuity and outsmarting ICOM. I disassembled the pack, popped in the batteries, and screwed it back together. I plugged in the wall charger and stood there, my power plug in my right hand, my new cheap battery in my left, when I made this discovery—there was no hole on the BP-4 for the power plug! I turned the battery over seven or eight times, searching for the jack. There was none. It turns out that the battery pack with the unreplaceable NiCds has the charging jack, but the pack for the replaceables doesn't! I had just spent $15.25 on something that I couldn't use unless I spent another $74.50 for the proper charger. (Please see paragraph one.) So much for saving money.

I realized that I could simply cobble some jumper clips onto the two contacts on the bottom of the pack, hook them to a current-limited supply, and charge the battery. This was OK, but every once in a while I slammed the door too hard on the way out of the shack and the jumper clip would jump off (no doubt that's why they call them that). I'd come back sixteen hours later to a completely uncharged battery. I toyed with the idea of converting an old HT-200 charger, but I knew that I'd get *that* project done sometime in 1998. I needed a quick-and-dirty yet reliable setup to charge my battery.

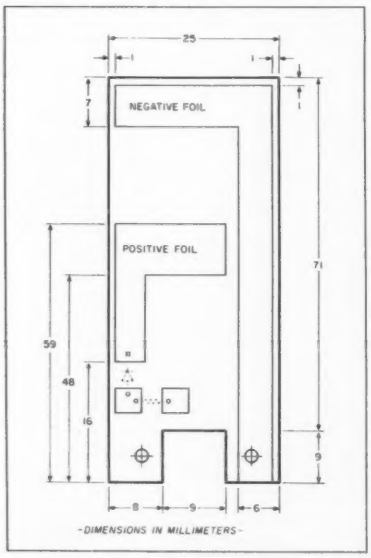

Fig. 1. PC board dimensions. The two small foil pads provide mounting points for CR1 and R1. Their dimensions are not critical.

Eureka!

The final result can be seen in Photo A. The adapter allows the regular wall charger power plug to be plugged into the BP-4 battery pack, charging through the output terminals. The small amount of circuitry on the board imitates the circuit found inside the standard pack. The adaptor slides onto the top of the battery, under the lips that normally hold the radio and battery together. It provides a solid means of providing contact to the ± terminals, and can be built in about thirty minutes.

Construction of the adapter is quite simple, but it is critical in two areas. The printed circuit board used must be quite flexible, since it needs to bend slightly in order to be slid into the pack. Common dime-a-dozen hamfest boards work quite well. An alternate method is to use a piece of stiff plastic material, and cement brass stock to it. The other critical spot concerns the 1mm gap around the outside of the board. This prevents the traces from touching the ± terminals at the same time while the adaptor slides in and out. Failure to include the gap on your board would cause a momentary short circuit each time the adaptor was used, which your battery doesn't like. If the phone rang while the adaptor was exactly half way out, you'd return to a pile of smoking plastic. Don't forget the gaps.

You can etch the board, but the "X-acto-Knife-Cut-and-Peel" method works fine. I cut the side gaps with a file, running diagonally across the edge of the board. The notch at the bottom of the board was cut in with a nibbling tool, but a file and some patience work just as well.

The BP-4 adapter is certainly not a high-tech device. Until you get around to building that Multi-Voltage/Digital Readout/Auto Cycling/Drop-In battery charger, however, it isa quick, cheap, reliable method for charging "jackless" ICOM batteries. 73

Parts List

CR1	*1N914, 1N4148 Diode*
R1	*82 Ω ½ W Resistor*
J1	*Coaxial Power Jack (RS #274-1565)*
	Thin, Flexible PC Board Material

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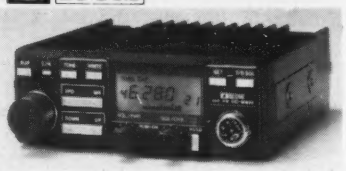

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Kenwood TS-440S/AT	Call for trade
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PARTS

1.5 Amp/400V full wave bridge rectifier	1.95
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73 Review

by Pete Putman KT2B

ICOM IC-12AT:

The Exotic 23-cm Hand-held Transceiver

ICOM America, Inc
2380–116th Ave. NE
Bellevue WA 98004
Price Class: $460

FIRST 1.2-GHz HAND-HELD

We've graduated from watching Captain Kirk and Mr. Spock with nifty pocket communicators to the real thing. . . a portable, 1-watt FM transceiver for 23 centimeters, courtesy of ICOM. It's not quite as small as those legendary communicators, but it has a lot more features and doesn't depend on dilithium crystals for its energy source.

Plenty of Features

The IC-12AT does make a compact package, slightly larger than the IC-02AT/03AT/04AT series radios at 6 ½" H x 2 ½" W x 1 ½" D. With the supplied BP-3 battery case, this great little handheld makes for an easy tote at just over one pound.

The output power is rated at 1 Watt and 100 mW on high and low power settings, respectively. This should mean quite a long period between charges except that the current consumption is rated at nearly 900 milliamperes in the high-power position. With the standard battery voltage of 8.4 volts, that means that the IC-12AT uses nearly 7.5 watts battery power to generate that 1 Watt output as well as run everything else on board. This rig draws 400 milliamps in the low power position, meaning 3.3 Watts of power are consumed to generate 100 mW output. Solid state microwave circuits tend to be rather inefficient. The batteries are dead after several hours of average-duty operation on high power. The transceiver also connects directly to a 13.8-volt power source to eliminate the battery pack altogether. The battery pack will even charge while connected to this jack.

The IC-12AT accepts all of the accessories of the IC-0X series handhelds. Users familiar with with other radios in this series will find many familiar functions, including subaudible tone selection and activation, DTMF signalling, memory scan, programmed band scan, and priority channel mode. The IC-12AT features two new controls essential to 23 cm operation: RIT (Receive Incremental Tuning) and VXO (Variable Transmit Offset). The former shifts the receive frequency up or down by 5 kHz from the display, while the latter shifts both.

The antenna will surprise some folks. It's a flexible vertical that attaches via a TNC connector (as opposed to the more conventional BNC connector), and I wonder why ICOM made the switch. After all, BNC connectors work at this frequency without any appreciable insertion loss. Further, a BNC would allow easier connections to an external antenna or an outboard amplifier using low-loss cable. Besides, most hams are unfamiliar with the TNC.

The ICOM IC-12AT 23cm FM hand-held transceiver.

> ***"The IC-12AT accepts all of the accessories of the IC-0X series."***

The Inside Story

Internally, the IC-12AT has a few neat features. For one, the output stage is a power module instead of a discrete device—supposedly a first in hand-helds (according to the literature). The receiver is a dual-conversion design with no less than 3 bandpass filters before the 1st mixer to reduce spurious IMD products. A bonafide antenna relay is also employed instead of diode switching (this would account for some of the additional current consumption).

The receiver scheme has the first i-f at 59.55 MHz and the second i-f at 455 kHz. In fact, the second LO, i-f amplifier, mixer, FM detector, and noise amplifier are all on one IC (similar to the Plessey designs of some years ago). Although not unusual, it saves a lot of space, which is at a premium! The transmitter uses six stages to get to the final output power.

A Performance Test

Now for the burning question: How well does this rig work? After all, the 23 centimeter band presents a new challenge for hams familiar with 2 meters and 70 centimeters. A number of tests would determine the unobstructed maximum usable path, as well as the range through a fair amount of obstructions—such as a stretch of woods. A cleared field about 1/2 mile in length and nearby woods provided a suitable test environment for two IC-12ATs.

Both high and low power settings easily yielded clear communications over the length of the field. The effects of multipath from nearby objects were minimal. Trees noticeably attenuated the signal, and communications were completely lost after about 1/2 mile of separation through the woods of mountain laurel and pine.

During this test the more pronounced effects of multipath reflections and refractions became apparent. By remaining stationary and moving the IC-12AT through an arc of 90 degrees, 5 feet above the ground, no fewer than 20 peaks and nulls appeared in

that arc! Obviously, trees cause a problem with 23 cm.

A fairly unobstructed view of a nearby 23 cm repeater should prove a useful operational environment. The only consideration might be path loss, which in dry air at this frequency could allow about 2.5–3 miles (assuming a free-space attenuation figure of 4 dB/mile in clear air). Thus, if the handheld presented a full-quieting signal adjacent to the repeater, it might be 10 dB noisier at that distance. Remember that this only applies to dry air! Smog, haze, and moisture droplets will significantly increase the path loss, so much so that you might not be heard at all several miles away in heavy rain.

Consider another scenario: The Dayton Hamvention. Thousands of handhelds there transmit on frequencies from 50 to 450 MHz. A move to 23 cm with a set of IC-12ATs would avoid the crowd and the accompanying intermodulation problems. But what about reliable communications throughout the show grounds, both inside and out? Point-to-point communications in the flea market area should be easy. From the flea market to deep inside the arena contacts may prove difficult.

Radio wave reflection and refraction become apparent at microwave frequencies with surprising results. Some users of UHF hand-held radios claim performance is markedly better than at VHF in crowded environments like the inside of an office building. Remember that a lot of people cast clouds of doubt on the utility of mobile bands above 800 MHz, and look at the growth of users up there today. The bottom line is that propagation at 23 cm is different from the more commonly used ham bands, and it holds plenty of surprises for those willing to experiment.

Conclusion

Yes, the IC-12AT is exotic, all right, but fully functional. Its fairly sensitive receiver and respectable output power will allow efficient communications over a limited range. It is easy to set up and use, although battery consumption is very high. The supplied TNC antenna connector makes quick connections to other antennas and amplifiers somewhat inconvenient.

The rig holds plenty of potential for those who want to get away from the crowds on the lower bands. Experimenters should find plenty of exciting ideas to try out, especially with compact, high gain antennas. How about a vertical dipole driven element with a screen reflector? I'd like to see one of those out at Dayton in '88. And should we eventually launch an amateur satellite with 23 cm FM capacities, just imagine as you press the PTT line...

"Beam me up, Scotty!"...

TECHNICAL SPECIFICATIONS: ICOM IC-12AT TRANSCEIVER

Specification	Claimed
Frequency Coverage	1260–1299.99 MHz
Receiver Sensitivity	.32 uV for 12 dB SINAD
Squelch Law	.1 uV
Spurious Rejection	> 50 dB
Output Power: HI	1 Watt (measured on Bird 43)
LO	0.1 Watt (measured on Bird 43)
Current Drain :	65 mA
(receiver squelched)	
Unsquelched, max. audio	250 mA
Transmit, low power	400 mA
Transmit, high power	900 mA

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CIRCLE 247 ON READER SERVICE CARD

by Bryan Hastings KA1HY

Number 10 on your Feedback card

Yaesu FT-727R The First Duoband HT

More Features in Less Space

Yaesu USA
17210 Edwards Rd.
Cerritos CA 90701
Price Class: $520

Yet another stride has been made to pack more and more features into less and less space. In November of last year, Yaesu began marketing the FT-727R, an FM handie for the 2m and 70cm amateur bands. This HT, with the FNB-4A battery pack, measures approximately 8" high x 3" wide x 1½" deep and weighs a little under 1½ lbs. It hosts a daunting array of features. This review discusses how relevant, and even how employable, some of these 40-odd functions are.

Take note that the first version of this handie had some limitations, and Yaesu soon replaced it with the present model in February, adding $30 to the price tag. This review covers the present model.

The top panel of the rig, where the female BNC connector for the antenna is located, has three push switches for 0.5W/5.0W Power Out, Lamp, and VOX; the Squelch and On/Off/Volume controls; and three jacks for earphone, mike, and "Computer-Aided Tuning"(CAT). More about CAT later.

You might expect a dual-band rubber duck to compromise somewhere. Indeed, 70 cm gets short shrift with the supplied YHA-27 flex antenna. Several people reported getting much better performance out of a ¼"-wave on 440 MHz, though they had no troubles getting out on two with the YHA-27.

Sensitivity for the VOX is set by the High/Low small recessed slide switch on the FT-727R's back panel. Take note that the VOX function works *only* with an external audio output and mike, such as the Yaesu YH-2 Headset. This makes sense when you consider the feedback problem resulting from the internal mike picking up audio from the speaker—they are less than an inch apart. Unfortunately, there's no readily accessible control for the VOX delay, and I find the delay too short.

The LAMP on/off switch is very handy. Many HTs, like many digital watches, provide switches which have to be kept manually depressed to keep the lamp lit. The lamp adequately illuminates the LCD readout screen, though unevenly, since it is located on the lower right of the screen. The keys on the keypad glow green when the lamp is on.

Photo A. Front panel of the Yaesu FT-727 dual-band HT for 144- and 440-MHz operation. Power output is 5 Watts with the battery pack shown.

The right side panel has the Tone Burst/PTT, and the left, the FUNC, press switches. All three have good detent, though you have to be careful to press the right switch when using the PTT, since it is located under the same rubber covering as the Tone Burst.

The ON AIR/BUSY and BATTERY lamps are at the top left of the front panel. Moving down this panel from them, we find the speaker (approx. 1¼"diameter) and mike, then the multifunction LCD screen. Below the screen is the 20-key keypad, each with a primary function, marked on the key, and an alternate function, marked above the key and activated by the FUNC switch.

727R Keyboard Functions

How do these functions shore up? The '727R has most of the now-standard features of HTs—ten memories; frequency dialing from a numerical keypad, which can also be used as a touchtone pad; standard and programmed frequency offset entry; band, programmed, and memory scan; and frequency lock. A beep option acknowledges keystrokes, useful here since the keypad keys don't have good detent. The beep, however, is the same tone for any key depressed.

Two less common features are the SAVE function and battery life display. The save function allows the user to save on current drain in the receive mode by turning the receiver off for up to 9 seconds, and then reactivating for ½ second. There is a cycle timer on the screen that counts down to "0" before the frequency display. The radio will stay in receive as long as there is a signal present. In the present version, the battery-saver function restarts after transmitting. In the old version, key-up deactivates the battery-saver function.

The battery command lets the user monitor battery drain by a voltage display on the screen. The scan function is adequate but has some limitations.

First, it takes almost two minutes to scan one megahertz in 10-kHz steps. Second, there's no way to mask out unwanted frequencies in a scan. Finally, the programmed scan is awkward. A conventional programmed scan is set by entering the two boundaries of the scan and the step size. The FT-727 requires you dial in the starting boundary, then the number of steps to take. You have to calculate the number of steps by the step size to get the scan range!—and that

range is limited to 99 steps x 10 kHz/step = 990 kHz, or just under one megahertz. Also, when the receiver stops at a busy frequency, the programmed scan deactivates. To scan the same portion of spectrum, you have to first dial in the original boundary. All in all, the programmed scan is limited and cumbersome to use.

The FT-727R's memory capacity is quite adequate. It has 10 memory cells, and you can store non-standard offset frequencies in the first four. This is a big improvement over the original model, which accepted only three standard offset frequencies into memory (the other 7 cells were for simplex). You can set and enter the offset into a memory conventionally by using SHIFT and the − or + repeat key. The alternate (and easier) method, however, is to enter the receive frequency into memory, and then dial up the transmit frequency and enter *that* into the same memory cell, using the TX M command.

The memory mode is easy to use. It requires only 2 keystrokes to enter a dialed frequency into memory and only one keystroke to recall a memorized frequency when the rig is in the memory mode. There is also a CALL (priority) memory, a frequency that can be recalled with a single keystroke.

One curious feature is cross-band operation, with the transmit and receive in different bands. I went up to the local Pack Monadnock mountain and hooked up with Ted W1ALE in Concord NH (40 miles NE, as the electromagnetic wave flies). He has both a 440 and 2m repeater in Concord. I transmitted on two and received on 440. Imagine the confused looks on the faces of the people monitoring the one-way conversations on each machine! I am hard put to think of a real use for this feature. A dual-band *single sideband* handie would be really neat for OSCAR 10 work.

The combined S-meter/Power out/Memory cell indicator is a clever design. All of this is represented by a 10-element (each element numerically labelled) LCD bar graph at the bottom of the screen. When in memory mode, only the element of the memory cell called up shows. Its only failing is that the display doesn't return to the original memory cell flag after transmitting in memory mode.

Photo B. Top panel of the 727R.

Just What Is CAT?

Computer-Aided Tuning means remote control of the rig from a computer's serial port, and a number of Yaesu transceivers use CAT. Digital data is transferred serially at 4800 bits/second. The proper initializing command from the computer prompts an acknowledgement response from the '727R, a process called "handshaking". All functions on the rig can be controlled from the computer. Rig memory is limited only by the memory of the computer, and the rig's scan rate can be increased from 1–2 channels/second to up to about 3–4 channels/second.

"Calculate the number of steps by the step size to get the scan range!"

Yaesu wasn't fully prepared to support CAT when they introduced the rig on the market. Charlie N3CXO made several unsuccessful attempts to obtain the ASCII codes from Yaesu about a month or so after the new version of the FT-727 came out. Engineering Consultants in Brea, California, produced the first software/hardware package to interface the '727R with a computer (Commodore 64) only last June. According to Bob NI6R this lag occurred because they had to "reverse- engineer" the 727R. They received only scanty programming data from Yaesu. This package will soon be available from Engineering Consultants for the IBM PC, and another package will soon be available from Applied Solutions in Garden Grove, California. Now programming data is also available from Yaesu.

The '727R is very easily modified for out-of-band operation. There is a switch on the rig that clears the CPU, and it can be reprogrammed by a 6-digit initialization code entered on the keypad. There is a code that isn't listed in the operation manual which expands the coverage of the rig to 100–199 MHz and 400–499 MHz. The FT-727R has not been type-accepted by the FCC for this operation.

Conclusions

This is by no means an exhaustive review. I can't comment on the rig's tone squelch operation (subaudible tone encoding/decoding), which functions only with the FTS-6 option board, and, of course, the CAT needs a full review.

The rig is well isolated. Last week I took a walk deep into the woods to gaze at our beautiful fall foliage and to find a relatively RF-free spot, and in scanning both bands, the squelch opened only twice—for activity on two local repeaters. This is also an ideal rig for those with 2m repeaters that have a remote control input on 440 MHz.

The FT-727R's main shortcomings are the programmed scan and slow scan rate, compromise rubber duck on 440 MHz, and Yaesu's weak support for the CAT feature. The rig is a bit pricey at $520, but I found it state-of-the-art and completely reliable in my several months of operation.

The Complete 2m/70cm Mobile Station

By now, you may have thought it would be great to convert the FT-727R into a mobile station, but where in the world am I going to find a dual-band power booster and outboard antenna? These units are already on the market! Be on the lookout for my next review which will feature the World Systems Engineering WP-727DX Power Booster and Rad-Com's new DDRR antenna, the CR2/4A "Untenna".

My thanks to Charlie N3CXO, Bob NI6R of Engineering Consultants, and Michael Henderson N6JFD of Yaesu USA, for sharing their experiences with the 727R with me. 73

FT-727R TECHNICAL DATA

	2-m	70-cm
Standard Frequency Coverage	144–148 MHz	440–450 MHz
Power Output	4.5 W(HI) 0.5 W(LO)	3 W(HI) .3 W(LO)
Squelch Law Sensitivity	.18 µV	.17µV
(10-dB quieting)	.25 µV	.25µV
(20-dB quieting)	.45 µV	.4 µV
Selectivity	±15 kHz (< 20 dB)	±12 kHz (< 30 dB)

Andrew Mill KD2WA
5312 Ernest Rd.
Lockport NY 14094

Number 3 on your Feedback card

FT-209 Modifications

Jump to New VHF Frequencies.

Don't you wish your Yaesu FT-209R/RH or 709R would go above 150 or 450 MHz like ICOM's HTs do? I did, so I called the Yaesu service center to find out how to go about doing this. The technician I spoke with told me this was "secret" information, but allowed that their equivalent commercial units have the same microprocessors as the FT-209 and FT-709 HTs.

That's all I needed to know. I opened my radio, heated the soldering iron, and proceeded to jump pins in the control unit until I found the correct configuration. [Ed. note. this is *not* a recommended procedure!] The following are the results.

The Mods

The modifications are:

- Extended frequency coverage
- Enhanced power saver
- Improved scan feature
- Increased receiver sensitivity.

The extended frequency modification allows you to program the lowest and the highest receive and transmit frequencies. The enhanced power saver allows receive times 0.4 to 4.0 seconds, in 400 millisecond steps. The new scanner stops on a signal and waits for the conversation to conclude, and then restarts scanning after two seconds. Finally, a quick tune-up of the RF amplifier increases receiver sensitivity.

Doing the Work

To open the radio, first remove the battery pack and and turn the radio on and off once to discharge the circuitry. Next, remove the the four screws holding the battery track and pry it out. Remove the two screws holding the belt clip and the one beneath it. Also, remove the two screws holding the carrying strap to the radio.

Now, slide a flat jeweller's screwdriver in from the bottom, between the black side trim and the radio, until it stops. Twist the screwdriver, and the trim should pop off. Now remove the two side screws and slide the U-shaped back cover off. At this point, be careful not to damage the electronics. Now, remove the four tiny Phillips-head screws holding the front panel into place, then fold the panel to the right (in the 709R, you have to desolder a ground jumper on the left-hand side.)

The Jumpers

Take the following steps to extend the frequency coverage on the 209R/RH:

1. Jump (solder across) pins 1, 7, 9, 10, 11, 13, and 16. Leave the pre-soldered pins alone.

2. To extend the power-saver, jump pin 12.

3. Remount the front panel with the four small Phillips-head screws.

4. Standard VCO range is 136–153 MHz. To move the VCO span up, turn TO1 (on the control board) clockwise (inward) one to two turns, one turn at a time. TO1 is located in the 1" x ¾" shielded enclosure. This is the left hole when the unit is face-down and bottom toward you.

I adjusted the VCO to span 142–157 MHz to prevent lostpower and sensitivity in the ham bands. You may have to remount the battery track, reset, and program the unit for 150–160 MHz, and move TO1 until RF output is indicated on *no higher* than 156.5 MHz.

5. To get improved sensitivity, remove the front cover, dial 146 MHz, and, with a generated signal, tune TO2, TO3, and TO4 for maximum signal. These are the three consecutive cans from the antenna jack on the receiver board (under the speaker).I found mine to be each ½ to 1 turn off. Also, adjust TO5, the fifth can from the antenna, for maximum signal.

Follow the steps below extend the frequency coverage for the 709R:

1. Same as for the 209R/RH, plus jump pin 4.

2. The power-saver modification can't be done here unless pin 12 is present.

3. Same as for the 209R/RH.

4. Same, but the VCO range 430–455 MHz. If TO1 is adjusted inward about two turns, the range shifts to up to 439.5–465 MHz.

5. Not necessary for the 709R.

6. Resolder the ground jumper between the control board and ground.

This completes the modification section. Reassemble the unit.

The Programming

When you finish the modifications and reassemble the unit, reset it once more. The programming:

1. In the first memory, enter the lowest receive frequency and dial, and in the second memory, enter the highest receive frequency and dial.

2. In the third memory, enter the lowest possible transmit frequency and dial, and in the fourth memory, enter the highset possible transmit frequency and dial.

3. Enter repeater shift F, and SHIFT

Here is a sample program for the FT-209R/RH:

```
reset
1451D
1570D
1440D
1480D
0600shift
```

This memorizes a receiver range of 145.1–157 MHz, + a transmit range of 144–148 MHz, and a 600-kHz repeater shift.

A sample program for the 709R:

```
reset
4420D
4650D
4400D
4500D
5000Fshift
```

This memorizes a receiver range of 442–465 MHz, a transmit range of 440–449.975 MHz, and a 5-kHz repeater shift.

The Performance

There is a loss of sensitivity in the lower 2 MHz of the band on the FT-209R/RH model, but, if the VCO is tuned as above, the ham bands aren't affected. There's no perceptible loss of power or sensitivity on the FT-709R.

In conclusion, go ahead and jump—and make your 209R/RH and 709 better than before! 73

Andrew Mill is a high school senior whose hobbies include current HT modification.

Public Service Scanning with Ten Tec HT

by Fred Lehman WD8MGO

The Ten Tec 2-meter HT can scan 149–158.995 MHz with just a few keystrokes. Follow these simple steps.

1. F V 0.000
2. F Λ 8.995
3. F 0 STEP 15 kHz (or your choice)
4. F MS PS

The handheld will scan upward from 150 MHz. To tune between 149.000 and 149.995 MHz, follow step 1 above then V LWR. This portion of the band must be tuned manually using the LWR key. Happy listening!

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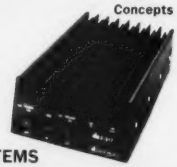

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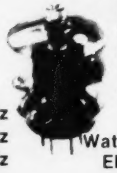

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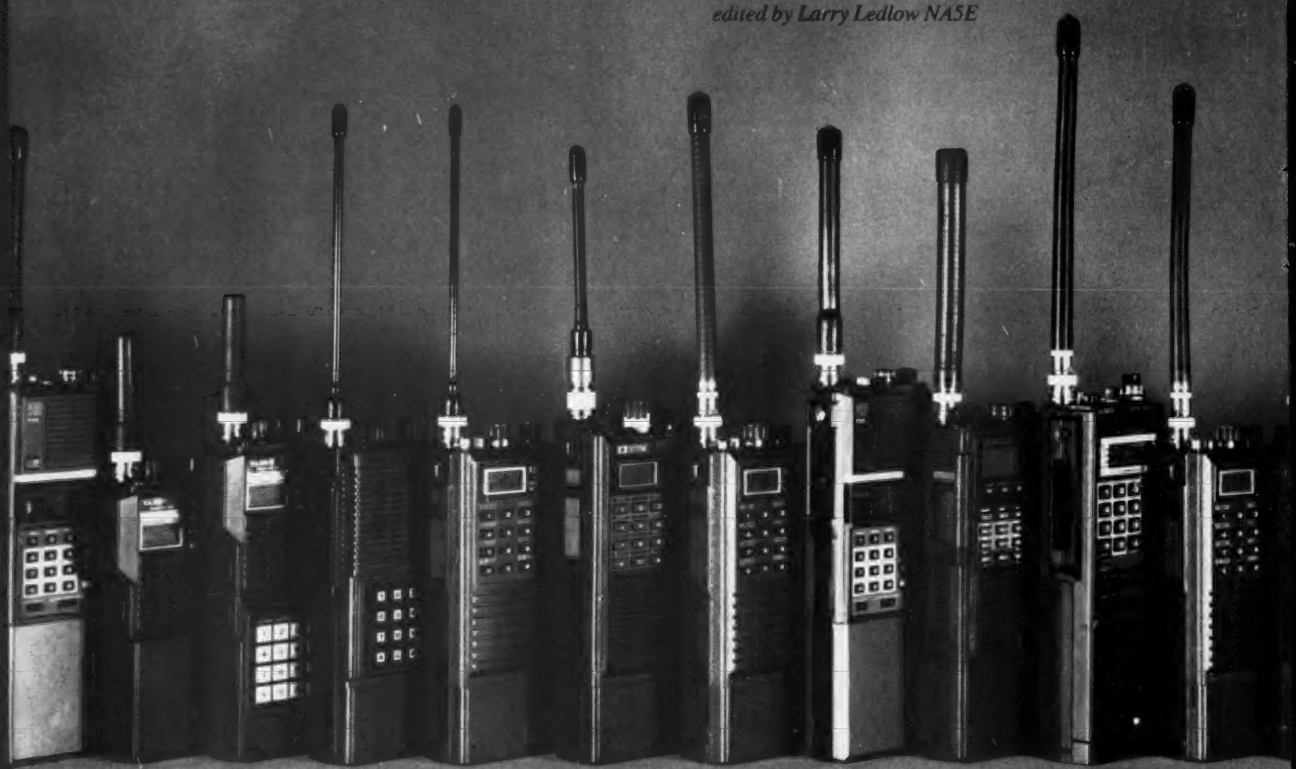
CIRCLE 41 ON READER SERVICE CARD

Hand-held Wish List

Number 17 on your Feedback card

edited by Larry Ledlow NA5E



A Condensed Buyer's Guide to HTs

The lives of hams shopping for a hand-held transceiver used to be simple. They only had to keep a few models and specifications in their head. For a while they could almost make the choice by tossing a coin. No longer! Now hams have a daunting selection of HTs, and even those folks dedicated to a single manufacturer must choose between two or three models for the same band. To ease the burden a bit, we have distilled a bevy of manufacturers' brochures into a reasonably complete list of hand-held transceivers available in the US marketplace.

About the Chart

Frequency coverage of modern synthesized rigs is generally very broad. Those units with microprocessor controls are extremely versatile and often cover MARS, CAP, or public service frequencies without modification. Many HTs receive or transceive well outside their published frequency limits, although some degradation in performance is possible. Note that it is *illegal* to transmit on a non-amateur service frequency using a rig without an FCC type-acceptance certificate, even if you have a license for that service! Some manufacturers do not publish frequency coverage specifications outside the ham bands.

Some companies brag about how much power their HTs produce and then sock the buyer with a surprise. More often than not, high power specifications require either an optional external DC power supply or a heavy duty battery pack. Don't forget the heavy duty charger for the battery pack, too. The combination can run well over $100 extra for high power options. Also, high power HTs tend to get very hot during long transmissions, because the rear panel of the units serve as heat sinks for the power amplifier. It is not always pleasant or possible to hold a 5-watt HT for a long time.

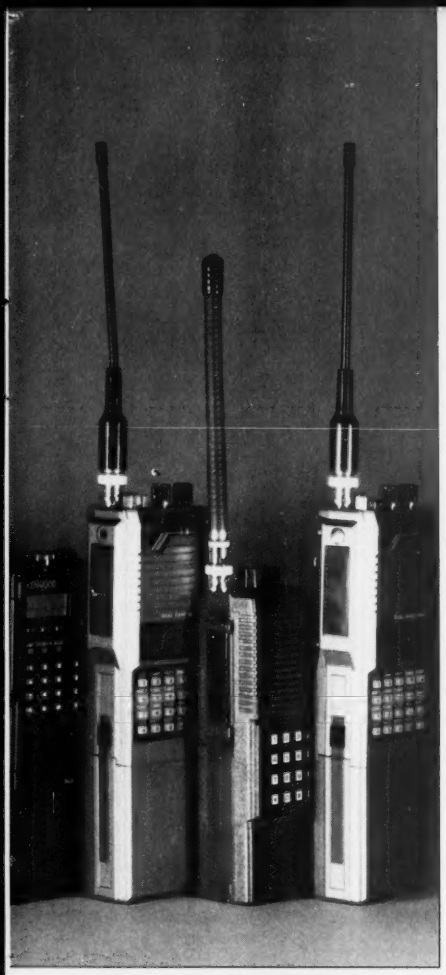
> ***"More often than not, high power specifications require either an optional external DC power supply or a heavy duty battery pack."***

Frequency entry or tuning is carried out manually (**M**) by stepping through the band or by direct keyboard entry (**K**). Naturally, for a fast change of frequency keyboard entry is the best choice. The higher-priced units universally offer this feature. Do not discount thumb wheels for fast QSY, though. You can normally make large frequency changes much faster with thumb wheels than with a manual toggle or electronic stepping.

Not so long ago liquid crystal displays (**LCD**) had a bad reputation. They were sensitive to shock and therefore unsuitable for the average HT operating environment. On modern transceivers, LCDs are sturdy and feature a lot of advantages over thumb wheel (**TH**) displays. LCDs often combine frequency display, S- and power output meter functions, memory selection, and other information. LCDs are also easily backlit for night viewing. Alinco offers a thumb wheel light, however, on its mini HTs.

Memories are always nice to have. If you have a lot of favorite frequencies to scan, then you probably want all the memory you can get. Almost all of the HTs with memories will store offset information with the frequency, but some will even store CTCSS tone information, too. Although we have not included all of the memory details here, they bear some consideration. On the other hand, if you're happy with that memory cell between your ears, you don't need a rig to help you along.

Automatic scanning saves a lot of work when looking for an active or clear channel.



Some rigs offer scanning only over the entire band (**B**), and others allow the user to program the limits of the search (**P**). Memory scanning (**M**) implies the rig can scan each memory consecutively. Some units allow the user to lock out selected channels. Still others allow the operator to select a scan stop strategy; e.g., stop on a busy or empty channel. We have not indicated these features on the chart. Priority scanning (**Y**) periodically and briefly searches a selected frequency for activity before returning to the main operating frequency. Manufacturers implement this feature in different ways, but the theory of operation is the same. It is a nice feature if you find yourself torn between two frequencies.

Standard repeater offsets in the United States are 600 kHz on two meters, 1.6 MHz on 220 MHz, and 5 MHz on 440 MHz. There are a few repeater operators who like to be different and use nonstandard offsets. With a fixed offset in your HT, you can forget about trying to be different. Some high-end handies allow programmable offsets, but this is far from an essential feature.

Various tone sets are available on HTs these days. DTMF (**D**) tone pairs allow access to autopatch facilities (if you know the access code) to make telephone calls. Some repeaters have interesting auxilliary functions that are controlled with DTMF tones. Time of day, temperature, repeater system status, and other data can come through your handy with a sophisticated repeater or base unit. CTCSS (**C**) tones are also called sub-audible tones, and they come in 37 standard frequencies. Some repeaters require a CTCSS tone to activate. Again, some repeater operators like to be different. This also helps cut down QRM. CTCSS tone selection is usually made with a DIP switch, though a few rigs offer CTCSS selection from the keyboard. We have not differentiated these methods in the chart.

The tone squelch feature (**S**) found on many rigs today is handy for those HT owners who like to be different. Tone squelch operation requires CTCSS *de*coding. In other words, the rig will not receive signals without the proper CTCSS tone encoded on them. Do not confuse this feature with a digital squelch function, which requires a series of DTMF tones to alert the radio's owner that someone wants to talk to him.

Most hand-held transceivers have BNC antenna connectors. This is virtually an industry standard. Kenwood and Alinco use "Thread-lock" (**THL**) connectors on their pocket-sized HTs. The thread-lock connector looks a bit like an RCA phono jack with threads. Note the nonstandard TNC antenna connector on the IC-12AT, too. Use of nonstandard antenna connectors makes attachment of other antennas or external amplifiers difficult at best.

We have listed the manufacturer's suggested retail price. If you pay the full amount, you probably won't be able to afford your subscription renewal to *73*. We like to think our readers are frugal and sensible. Check dealers for deep discounts and closeout specials. A little telephone shopping can save a lot of money. Consider the savings in sales tax when buying through out-of-state mail order. UPS or priority mail shipping costs on these little rigs are unlikely to match sales tax in some states. And make sure you tell the dealer you saw the information in *73*!

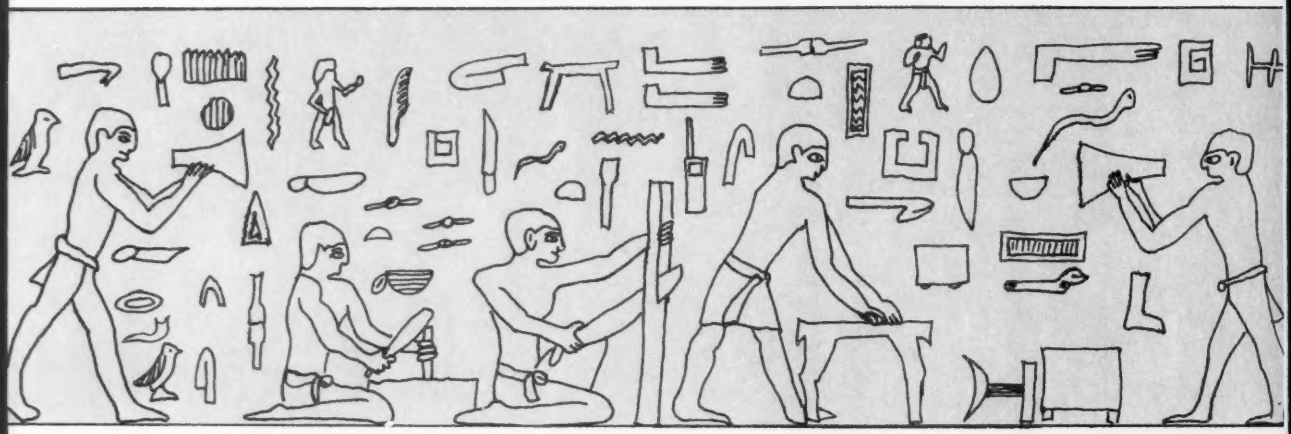
Brand	Model	Frequency (MHz)	Power Out	Freq. Entry	Display	Mem.	Scan	Offset	Tones	Ant.	Price	Comments
AEA	DX Handy	28.0–29.0[1]	2W	M (VXO)	Analog	0	No	NA	No	BNC	$319.95	SSB/CW
Alinco	ALX-2T	140–149.995	2W	M	TH	1	Y	Fixed	D,C	THL	$250	Mini HT
Alinco	ALX-4T	440–450	1W	M	TH	1	Y	Fixed	D,C	THL	$TBA	Mini HT
Alinco	ALM-203T	144–147.995	5W[3]	M,K	LCD	10	M,P	Prog.	D,C	BNC	$328	Rx 150–160 MHz
ICOM	IC-u2AT	140–149.995	1.5/3W[3]	M	LCD	10	M,B	Prog.	D,C	BNC	$329.00	Rx 140-169.995 Mini HT
ICOM	IC-2AT	144–147.995	1.5/2.5W[3]	M	TH	0	No	Fixed	D	BNC	$299.00	
ICOM	IC-02AT	140–151.995	3/5W[3]	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	$365.00	
ICOM	IC-3AT	220–224.990	1.5/2.5W[3]	M	TH	0	No	Fixed	D	BNC	$339.00	
ICOM	IC-03AT	220–224.995	3/5W[3]	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	$449.00	
ICOM	IC-u4AT	440–450	1.5/3W[3]	M	LCD	10	M,B	Prog.	D,C	BNC	$369.00	Mini HT
ICOM	IC-4AT	440–449.995	1.5/2.5W[3]	M	TH	0	No	Fixed	D	BNC	$339.00	
ICOM	IC-04AT	440–449.995	3/5W[3]	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	$449.00	
ICOM	IC-12AT	1260–1299.99	1W	M,K	LCD	10	M,P,Y	Prog.	D,C	TNC	$459.00	
Kenwood	TH21BT	141–150.995	1W	M	TH	0	No	Fixed	D,C[2]	THL	$259.95	Mini HT
Kenwood	TH31BT	220–225	1W	M	TH	0	No	Fixed	D,C2	THL	$269.95	Mini HT
Kenwood	TH71BT	440–450	1W	M	TH	0	No	Fixed	D,C[2]	THL	$269.95	Mini HT
Kenwood	TH205AT	142–148.995	2.5/5W[3]	M	LCD	3	B	Fixed	D,C[2.5]2	BNC	$259.95	Rx 141–163 MHz
Kenwood	TH405AT	440–449.995	2/5W[3]	M	LCD	3	B	Fixed	D,C2,S[2]	BNC	$269.95	
Kenwood	TH215A	141–151	2.5/5W[3]	M,K	LCD	10	M,P,Y	Prog.	D,C,S[2]	BNC	$349.95	Rx 141-163 MHz
Kenwood	TH415A	141–151	2.5/5W[3]	M,K	LCD	10	M,P,Y	Prog.	D,C,S[2]	BNC	$359.95	Rx 141-163 MHz
Santec	ST-20T	142–150.995	3/5W[3]	M,K	LCD	10	M,P,Y	Prog	D,C	BNC	$369.95	
Yaesu	FT209R/RH	144–147.995	2.5/5W	M,K	LCD	10	M,P,Y	Fixed	D,C,S[2]	BNC	$359.00	RH price given
Yaesu	FT109RH	220–224.995	5W	M,K	LCD	10	M,P,Y	Fixed	D,C,S2	BNC	$379.95	
Yaesu	FT709R	440–449.957	4.5W	M,K	LCD	10	M,P,Y	Fixed	D,C,S[2]	BNC	$ 359.95	
Yaesu	FT23R	144–148	2/5W[3]	M	LCD	10	B,Y	Fixed	D[2.C]2,S[2]	BNC	$269.95	Mini HT
Yaesu	FT73R	440–450	2/5W[3]	M	LCD	10	B,Y	Fixed	D[2.C]2,S[2]	BNC	$279.95	Mini HT
Yaesu	FT727R	144–148/440–450	5W	M,K,Y	LCD	10	M,P	Prog.	D,C2,S[2]	BNC	$499.95	CAT System input

Note 1: AEA's DX Handy covers any two 50 kHz segments of the 10-meter band. Requires crystals.
Note 2: Available as an option.
Note 3: Higher power output with an optional battery pack or DC power supply.

Milo Q. Fosman, Ph.D.HT, M.S. 2MFM
Professor
Ancient Modulation Cultures
Harmouth College

Number 9 on your Feedback Card

A History of Hand-Held Communications: Their Place In Western Civilization



A partial transcript of a pseudo-scientific study of man's never-ending quest for hand-held personal communications, presented by the alleged Dr. Fosman at a recent meeting of S.C.A.M. in Paris.

Numerous experts and scholars agree that one of man's instinctive needs is communication with other members of his species. This fundamental need is grouped with other essentials such as thirst, hunger, sex and home video. Indeed, research in this area has revealed that even the higher primates have demonstrated an amazing capacity to grasp the concepts of speaker microphones and flex antennas.

The Beginnings

Cave drawings from the Stone Age have revealed, upon closer inspection, a central figure coordinating the group hunt of a Mastodon with a ram's horn strapped to his left wrist. Other scholars have uncovered similar drawings in Asia Minor. One group from a leading East Coast university claims to have found evidence of the world's first repeater. The drawing in question depicts members of the hunt some distance from the leader with ram's horns attached to one ear apparently repeating instructions through their wrist units.

Studies of the so-called "Golden Age" period in the fertile crescent point to an interesting development. The growth of metropolises such as Baghdad and Babylon are coupled to the simultaneous rise in the use of personal horn units, each with individualized low-level resonance, or "sub-tone" characteristics. The latter was determined by the shape of the horn and the length of time it lay bleached in the sun. There has been conjecture that the legend of the Tower of Babylon may have arisen because ground stations were all creating different "sub-tones" and the repeater attendants atop the tower couldn't understand the hundreds of messages bombarding their receiving horns.

"Evidence exists of experiments via tropospheric scattering using horn blasts across the Nile."

The Egyptians were believed to be the first in developing the principal of a reflector with gain characteristics to aid in carrying messages over longer paths than previously attained. Indeed, the pyramidal design of these massive structures lends itself very well to this function, and evidence exists of experiments via tropospheric scatter using horn blasts across the Nile. These often occurred before intense thunderstorm activity, and may have been crude attempts at using a repeater system to warn of impending severe weather.

Further Advancements

The Romans carried the Egyptian research a step further by siting their repeaters along the extensive aqueduct system crisscrossing Gaul. They discovered that very large horns placed strategically along these routes could capture weaker signals using the reflective characteristics of the walls of the duct, allowing more distant spacing of the manned repeaters. This effect was later called "aquaducting", and many references are made of the phenomenon in writings of that period. The Romans are also credited with using bronze and copper horns to replace the more fragile ram's horn.

Memory storage came into being with the introduction of mynabirds into Europe by African traders. A typical repeater with memory storage might employ up to 10 horns placed along the focus of several aquaducts. Each horn would employ a mynabird in a cage placed at the focus of the horn. With suitable prompts, the attendant would be able to record messages sent from distant ground units of up to 5 words. By placing the apparatus on a revolving platform, the attendant could scan the various messages as needed.

Or, by placing a cloth over any particular mynabird's cage, he could lock out any undesired channels by causing the bird to go to sleep.

During the epoch of the Holy Roman Empire, alchemists of the period developed a technique by which mynabirds and parrots could be trained to repeat their messages into an adjacent horn for automatic retransmission. When no further transmissions were needed or desirable, two intertwined strands of rope could be pulled from below to release covers over each cage. History thus credits them with inventing the fully automatic unmanned repeater station with "twisted pair" control. Further development came when the Saxons employed the turntable concept of the Romans to further speed up the process.

Hand-Held Advancements

Developments in hand-held horns were keeping pace. As stated earlier, the fragile ram's horn had been replaced by units weighing a few ounces which were made from copper or bronze. These latter types were preferred by Hannibal's army when he invaded the Alps, due to more stable dimensional qualities in colder temperatures. Copper models came equipped with more than one horn to allow multi-channel operation. Some deluxe models were made for members of the ruling classes and high officials of the Roman Catholic Church by expert goldsmiths and metalworkers. These luxury models incorporated a tiny sundial to tell time, and up to four discrete horns.

At this time, contacts made with Asian civilizations revealed that they were also working on advanced hand-held horn units, cast entirely from ceramic to withstand high temperatures and the effects of salt air. These units found immediate favor with Portuguese and Italian traders, replacing the corrosion-prone copper and bronze models used on ships. Another development came when larger horns with more gain were installed alongside the major piers and docks of European seaports for ships in port using conventional small horns with limited range. The user would place the opening of his small horn near the focus of the larger fixed horn, resulting in a louder signal. These "docking boosters", as they became known, revolutionized sea travel.

During the Middle Ages, the popularity of these hand-held units became immense, and it followed that a profusion of repeaters sprang up in major metropolitan areas. In many cases, the outputs of these repeaters were so close to each other that users experienced considerable interference. Attempts by the repeater attendants to increase the horn size and thus the power of the signal proved fruitless, and resulted in interference to other nearby repeaters. Regional leaders agreed to meet on a voluntary basis at a site near present-day Paris to annually discuss the location and operation of their repeaters, thus originating "repeater councils". Penalties for violators were stiff, including execution and exile.

Experiments were being conducted by the leading scientists of the time to improve message storage and capacity. One of these was Da Vinci, who experimented with various forms of parrots as opposed to mynabirds. He claimed that East African parrots offered over 256K of storage as opposed to the 128K found in the common mynabird. Opponents argued that the parrot would prove more temperamental and less reliable in automatic repeater service. Other experiments involved the use of mockingbirds for night-time transmissions. Hand-held designs continued, with a wide variety of models offered for sale. One of the more popular units employed a clever scheme, mounting a smaller horn coaxially inside a larger unit.

This allowed simultaneous transmissions on two different channels, giving rise to "full duplex" operation. However, existing repeaters could only handle one message at a time, so use was limited to loosely organized clusters of fishermen who passed weather information among themselves while in port.

These groups, known as "fishermen's nets", proved an efficient means to conduct discussions among two or more users.

"The Court of Louis XIV favored an elaborate model manufactured in Italy."

As in most societies, secrecy of communications was of paramount importance both in times of war and in everyday transmissions between government agencies. It is not known who actually discovered the technique, but writings recovered from Greece, Malta and Carthage show a scheme employing the honeycomb of bees inserted in horns to purposely distort the audio for all but a similarly-equipped horn. The effect to the average listener would sound like a distorted "buzz". However, this "cellular" technique was never perfected and fell out of favor.

Attempts were made to ensure secrecy by attaching sections of pipe between adjacent buildings so that users could talk in confidence. This technique became known as "private line" and continued for many years, and indeed was the standard method for communications between adjacent villas in the Vatican. However, long range security remained a problem, as the only reliable method in use involved "carrier" pigeons, which could easily be downed in flight and any messages read. Some innovative attendants evolved a scheme wherein the parrots used in a repeater could be released in flight to travel to another distant repeater site. In this way, they could retransmit their stored messages over greater distances. Again, a sharpshooter could down the flying bird and "capture the repeater", precluding its use by others.

Time Marches On

Repeaters aided in navigation. On Columbus' initial voyage, his lookout climbed to the crow's nest and, using a small, lightweight ceramic hand-held horn from Japan (which was popular at that time) made contact with the repeater on San Salvador Island in the Bahamas Chain, leading to his now-famous discovery of America. John Cabot explored and mapped the northern coast of the continent by using a large co-linear array of multiple horns to produce echos. Henry Hudson introduced repeaters and bronze hand-held horns to Native Americans. He is credited with installing the first repeater sites in New York City.

Hand-held units continued their evolution. The Court of Louis XIV favored an elaborate model manufactured in Italy, which incorporated two sundials, 6 horns, and numerous tiny bells which served no apparent function except as a decoration. To get the attention of a repeater attendant several miles distant, a whistle was attached to be used prior to each series of transmissions, thus originating the term "whistle-up the repeater". This is also the first documented appearance of "bells and whistles" on hand-held units.

Ornate hand-held units also found their way to the colonies of America, and many of these were pressed into service during the Revolutionary War. Ben Franklin, who was fond of tinkering with gadgets, developed a system of linking several horns and birds together at a repeater location to allow multiple channel operation simultaneously.

This solved a technological puzzle that had existed since the Middle Ages when multi-channel horns became popular. Using a system of elastic bands to suspend a homemade acoustic chamber resembling a cross, Franklin then focussed four repeater horns so that the received audio could cross-over through the center port and go out any of the others, depending on which ports were closed or open. This technique, which Franklin named "cross-band linking", was an overnight sensation.

One common problem with all horn repeaters was their susceptibility to vandalism. Young boys bent on a prank would often stuff the horns with any number of objects. Some even dumped pots of homemade berry preserves into the ports (much to the delight of the birds). This action was the source of the expression "jamming the repeater". Fortunately, they usually ate some of the jam themselves and were quite sloppy about it. The telltale stains gave them away, so finding these jammers was simply a matter of being observant.

NOTE: Reprints of the unabridged transcript of Dr. Fosman's presentation are available from WIFF (The World Is Flat Foundation). 73

Professor Fosman's professional interests include psycho-historical studies of ancient cults and their followers. His latest monograph, The ARRL 1932-35: The Golden Years, *will appear at booksellers in the spring.*

Number 23 on your Feedback card

FUN!

Ham Radio's Lighter Side

John Edwards KI2U
P.O. Box 956
Mt. Laurel NJ 08054

FUN POLL: HOW HAMS VIEW THEMSELVES

OSCAR 1, the Benton Harbor Lunch Box, The Dayton Hamvention, W1AW—all ham radio legends. And now you can add the FUN! Poll to that august list.

Look at it this way, you do anything long enough and it becomes a legend. Since this is the seventh FUN! Poll, I say it's long enough and declare this venture a legend.

The questions are below. Answer them and help me track the trends in this hobby. Send your responses to the address at the top of this column. If you have a modem-equipped computer, you can also respond via CompuServe (70007,412), The Source (CPA117) or MCI Mail (JEDWARDS).

Have fun. After all, how often do you get to participate in something legendary? 73

Element 1—Background

1) Sex:
A) Male B) Female

2) Age:
A) 15 or below
B) 16–21
C) 22–39
D) 40–59
E) 60 or above

3) License class:
A) Novice
B) Technician
C) General
D) Advanced
E) Extra

4) Number of years licensed:
A) 1 year or less
B) 1–5 years
C) 6–10 years
D) 11–20 years
E) 21 years and up

5) Do you have a new (post-March '78) call?
A) Yes B) No

6) How many hours a week do you devote to amateur radio?
A) 0–1 hours
B) 2–5 hours
C) 6–10 hours
D) 11–20 hours
E) 21 hours or more

7) Which HF band do you use most?
A) 80/75 meters
B) 40 meters
C) 20 meters
D) 15 and/or 10 meters
E) Don't operate HF

8) Which VHF/UHF band do you use most?
A) 6 meters
B) 2 meters
C) 220 MHz
D) Higher frequencies
E) Don't operate VHF/UHF

9) Which mode do you use most?
A) SSB
B) CW
C) FM
D) RTTY
E) Other

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, and club and other incidental expenses.)
A) $0–$250
B) $251–$500
C) $501–$1,000
D) $1,001–$2,500
E) $2,501 and up

Element 2—Social Characteristics

11) On the whole, hams are:
A) Too young
B) Too old
C) Just the right age

12) Do you like rock music?
A) Yes B) No

13) Politically, how would you define yourself?
A) Conservative
B) Middle-of-the-road
C) Liberal

14) Should we get rid of the ARRL?
A) Yes B) No

15) How old were you when you first became a ham?
A) 15 or below
B) 16–21
C) 22–39
D) 40–59
E) 60 or above

16) Should the FCC increase the speeds on amateur CW examinations?
A) Yes B) No

17) Do you own a home computer?
A) Yes B) No

18) If you answered "yes" to question 17, which brand?
A) Apple
B) IBM
C) Radio Shack
D) Commodore
E) Other

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
A) Yes B) No

20) Are hams getting dumber?
A) Yes B) No

21) Do business interests deserve some of our virtually abandoned bands?
A) Yes B) No

22) Should ham licenses have a minimum age requirement?
A) Yes B) No

23) Should ham licenses have a maximum age requirement?
A) Yes B) No

24) Should hams be subject to periodic retesting?
A) Yes B) No

Element 3—Habits

25) If the users were restricted to data communication only (no phone or CW operation), would you be in favor of a no code 220-MHz Digital-class license?
A) Yes B) No

26) Would you be in favor of such a no-code 220 MHz Digital class ticket if it permitted phone operation in addition to data transmission?
A) Yes B) No

27) Have you ever used a personal computer in connection with your amateur radio activities?
A) Yes B) No

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
A) Yes B) No

29) What do you think of CW keyboards?
A) Love them
B) Hate them

30) Should we get rid of, or reduce in size, the CW bands?
A) Yes B) No

31) Do you think DX nets have a place in ham radio?
A) Yes B) No

32) Do you think nets in general have a place in ham radio?
A) Yes B) No

33) The next time a ham operates from space, which band should he/she use?
A) 2 meters
B) 220 MHz
C) 450 MHz
D) An even higher band
E) Shouldn't bother to operate

34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
A) Jam it
B) Ignore it
C) Complain to the FCC or some other organization
D) Listen
E) Join it

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes B) No

36) If required, could you pass the FCC theory test for your license class?
A) Yes B) No

37) Have you ever purposely operated in an amateur sub-band you weren't licensed to use?
A) Yes B) No

38) Are you fluent in any computer language(s)?
A) Yes B) No

39) If you answered "yes" to question 38, which language(s)?
A) BASIC
B) Pascal
C) Assembler
D) Machine
E) Other

40) Do you feel yourself competent to write a short BASIC program?
A) Yes B) No

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes B) No

42) Do you solder together your own coax connectors?
A) Yes B) No

43) Do you smoke while operating?
A) Yes B) No

44) Do you operate a packet radio system?
A) Yes B) No

45) What do you think of contesting?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

46) What do you think of DXing?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

47) What do you think of repeaters?
A) Great
B) Good
C) Okay
D) Don't like them
E) Despise them

48) What do you think of traffic handling?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

49) If you heard an emergency net in progress, would you immediately join in and offer your services?
A) Yes B) No

50) Have you ever secretly hoped for a minor disaster to strike your community so you can demonstrate your radio skills?
A) Yes B) No

Response Form

Instructions: Read each question and mark your response by circling the appropriate letter next to the number of the question.

Element 1:	9) A B C D E	16) A B	**Element 3:**	33) A B C D E	42) A B
1) A B	10) A B C D E	17) A B	25) A B	34) A B C D E	43) A B
2) A B C D E		18) A B C D E	26) A B	35) A B	44) A B
3) A B C D E	**Element 2:**	19) A B	27) A B	36) A B	45) A B C D E
4) A B C D E	11) A B C	20) A B	28) A B	37) A B	46) A B C D E
5) A B	12) A B	21) A B	29) A B	38) A B	47) A B C D E
6) A B C D E	13) A B C	22) A B	30) A B	39) A B C D E	48) A B C D E
7) A B C D E	14) A B	23) A B	31) A B	40) A B	49) A B
8) A B C D E	15) A B C D E	24) A B	32) A B	41) A B	50) A B

73 Magazine Product Report Card

Please rate any ham gear you're using from (0) poor to (9) superb.

Manufacturer	Model	Your Rating	When Purchased	Notes
1.				
2.				
3.				
4.				
5.				

Comments:_____

_____

_____

Your name, call, complete address:_____

_____

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The Payoff: Each month we'll draw a card at random. If yours is picked, you'll receive a one-year subscription (or extension) to *73*.

Article #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Great																									
OK																									
No Way																									

Article #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Great																									
OK																									
No Way																									

Name _____

Address _____

City_____ State ____ Zip_____

I'd like to see more _____

_____

I'd like to see less _____

_____

37D6F

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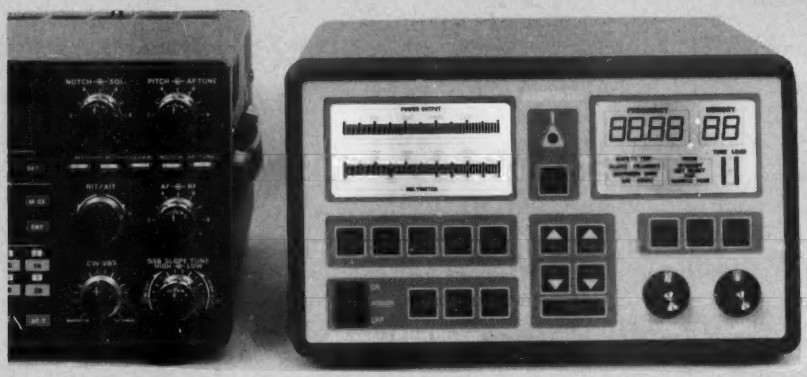
QUIET POWER!

" Linear here is a 230A, OM..."

When the word gets out, we expect you will be hearing this frequently. Two years in development, the 230A represents a new dimension in linear amplifier technology and operating convenience. Fully microprocessor based, the RF/power supply deck is remotely controlled via a small "microcontroller". No noisy, large enclosures at your operating position. The 230A provides maximum legal power on all amateur bands with no time limit in any mode.

Drive frequency is continuously monitored by the processor and adjustments made to ensure maximum amplifier output at all times. As you talk, the amplifier's tuning is constantly adjusted as required. Powerful gearhead motors drive the bandswitch, tuning, and loading capacitors.

HIGH QUALITY. The 230A is manufactured to the same standards as the 230C, the commercial/military version.
VERSATILITY. The RF/power supply may be remotely located near your AC source and/or antenna cables. The small microcontroller takes little room at the operating position.
PROTECTION. The processor monitors tube parameters to ensure ratings are not exceeded. The operator is alerted if any parameter is getting close to a safety trip point.
FULL QSK. Choose QSK operation and our unique design allows "real QSK" with complete safety...no worries about burned vacuum relays, etc.
Pair of EIMAC 3CX800A7's for high efficiency, low distortion operation. Pi-L output for high harmonic suppression.



230A Microcontroller by **ADVANCED RADIO DEVICES**
Remote RF/power supply deck is not shown.

TS 940 courtesy of EEB, Vienna, Va.

FEATURES

- Two custom, easy-to-read, back-lighted LCD displays which provide all metering, alarm and status information.
- Built-in VSWR computer with readout on the LCD display.
- Accessory connectors for RS-232C control and antenna switching.
- HEAVY DUTY hypersil power transformer with full wave rectification and Radio Switch 86 series bandswitch.
- Automatic safety monitoring for VSWR, grid and plate current, airflow, filament voltage, and efficiency.
- Easy modification for 10 meters if you qualify.
- Remote control. Place RF/power supply deck up to 250 feet from the microcontroller with optional cable. (15 foot cable furnished.)
- Modular construction for ease of maintenance.

Factory direct sales for lowest cost.
Introductory prices: 230A, $3695. 230C, $5500.
1 year guarantee.

SPECIFICATIONS

FREQUENCY. All amateur bands from 1.8 to 21 Mhz (to 30Mhz for export)
DRIVE. 50-80 watts for full power.
INPUT VSWR. 1.5:1 or less on all amateur bands. Slightly higher for WARC.
HARMONIC SUPPRESSION. -55dB
INTERMOD PRODUCTS. -35dB down.
DUTY. Continuous on all modes including RTTY.
ALC. Full ALC with exciter to prevent exceeding power limits.
INPUT POWER. 220-250VAC, 60Hz, 20 amperes max.
DIMENSIONS.
Microcontroller: **10** wide x **6** high x **8** deep (inches).
RF/power supply deck: **14** wide x **22** high x **13** deep (inches)

All interconnect cables are furnished for ease of set up.
In addition to the above, the 230C provides continuous frequency coverage from 1.8 to 30 Mhz with a no time output rating of 2250 watts PEP. Three 3CX800A7's are utilized.

Please call or write for additional information. We love to talk about these amplifiers!

ADVANCED RADIO DEVICES

103 Carpenter Drive, Sterling, Virginia 22170 **(703) 478-3100 FAX (703) 478-3105**

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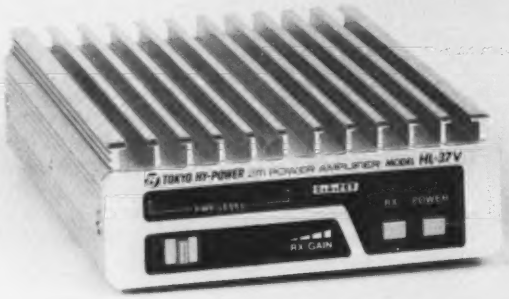
73 Review *by Pete Putman KT2B*

Power Play Comparison

RF Concepts RFC 2-23 and Tokyo Hi-Power HL-37V 30-Watt 144-MHz Power Amplifiers



Tokyo Hi-Power Labs
Subsidiary of Encomm, Inc.
1506 Capital Ave.
Plano TX 75074
Price Class: $100

RF Concepts
2000 Humboldt St.
Reno NV 89509
Price Class: $112

What would an issue about hand-helds be without a review of the most popular hand-held accessory? Here I've chosen two representative models of hand-held amplifiers (one US-made and one from Japan), each designed to take a nominal 2-watt input and amplify it about 10 dB. In addition, both feature GaAsFET preamplifiers for weak signal reception.

Background

Hand-held amplifiers aren't new. Over the past ten years design refinements have brought us from 10-watt power levels up to the current 25- and 35-watt units, which are nesting in ever-increasing numbers under car seats and in gloveboxes.

RF Concepts is a relatively new company, founded by Everett Gracey and Ken Holladay in early 1987. Both originally founded Mirage Communications in the early '80s, which was later purchased by KLM. RF Concepts offers a wide range of power amplifiers for 2 and 220 MHz, and new models for 432 MHz will appear soon. All employ GaAsFET preamplifiers.

Tokyo Hi-Power is the amplifier subsidiary of Encomm, a Texas-based importer and distributor of a wide range of VHF/UHF products, including Santec handhelds, Welz SWR meters, and Kenpro antenna rotors. They, too, have a wide range of power amplifiers to cover 144 and 432 MHz, and most of their designs use GaAsFETs.

PERFORMANCE MEASUREMENTS

Specification	*RFC 2-23*	*HL-37V*
Rf Power/DC Current: Input/Output	.3W/6W@2.0A 1.5W/25W@3.7A 2.5W/35W@4.4A	.5W/20W@3.8A 1.0W/25W@4.4A 2.0W/30W@4.6A
Measured SWR at input:	1.2:1	1.5:1
Preamplifier Gain:	14.5 dB	13.0 dB
1-dB Compression, output:	-11.0 dB	+2.0 dB

Description

Photo A shows the two amplifiers side by side. Both are small enough to stash just about anywhere. The RFC 2-23 measures 1¾" H x 3½" W x 5¾" D, and the HL-37V measures 1½" H x 4" W x 5¾" D. The RFC 2-23 is finished in a satin black, while the HL-37V comes in a brushed aluminum shade.

Front panel layouts differ somewhat. Controls for DC POWER, SSB/FM mode and PREAMP ON/OFF are rocker switches on the RFC 2-23. LEDs indicate when the amplifier is on, when the preamp is enabled, and when in transmit. On the HL-37V, pushbutton switches turn POWER on and enable the preamp, marked RX. The mode setting for SSB/FM is located on the rear panel. In addition, the HL-37V features a slider control for RX GAIN (more on this in a moment), and a bargraph LED display to show power output level.

Both radios use standard SO-239 connectors. The RFC 2-23 has a detachable DC power cord with Molex connector, while the HL-37V power cord is hard-wired. The former's power cord is somewhat heavier, using #16 wire as opposed to the #18 wire on the HL-37V. It shouldn't make much of a difference if you install with the supplied cords. Failing that you should use heavier wire where possible (#16 or better).

Photo B shows the interior of the RFC 2-23. The power device is a Motorola SRF3961, which works in a 12-dB configuration. Work-

manship is of the highest quality, and there are only two tuned circuits using ARCO trimmers. The design is very similar to Mirage amplifiers, as you might expect. RF-sensed keying is used exclusively, with the SSB/FM switch setting the drop-out delay. This is largely due to the primary market for these amplifiers, FM hand-held users. Protective diodes are used around the GaAs FET, a CF300 device with nominally 20-dB gain at a noise figure of about 1 dB. In addition, an automatic SWR protection circuit will kick in at about 3:1 VSWR. RF Concepts rates the maximum RF input at 5 watts, which I could not verify. Minimum input is specified at 200 mW, with approximately 30 watts output for 2 watts drive.

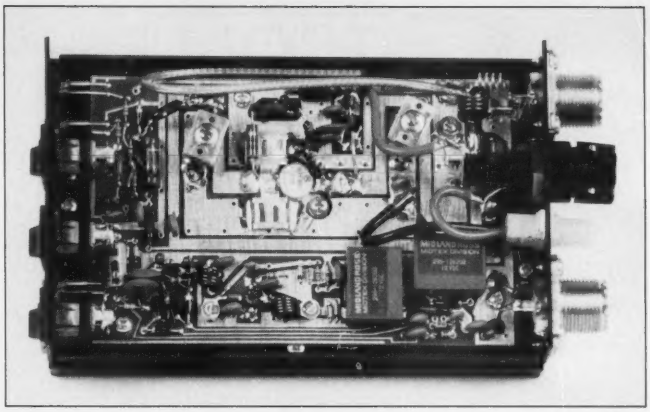


Photo B. Interior view of the RFC 2-23 amp.

Photo C shows the inside of the HL-37V. The active device is a 2SC1946A, also running about 10–12 dB gain. The amplifier does not use tuned circuits, but rather etched inductors and small fixed-value capacitors. Workmanship here is also very high quality. The PC layout is considerably more open than the RFC 2-23, but this is no comment on the engineering design.

The unit also uses RF VOX keying on both SSB and FM modes. No other provision is made for hard-keying, again for the reason that the majority of buyers will operate FM only. A 3SK121 GaAsFET provides a nominal +14 dB gain, and a unique slider control allows continuous adjustment of the RX gain from -20 dB to +14 dB. Protective diodes also isolate the GaAsFET.

Why the slider? Apparently in some places in Japan, there is so much RF on and near the 2-meter band that preamps tend to go berserk in the intense RF fields. The average unaided front end of a hand-held is similarly affected, so having a variable attenuator is a great help!

In practice, the adjustment to give unity gain is nearly 80% of full setting.

In contrast to the RFC 2-23, the Japanese unit affords no no VSWR protection. The manual strongly cautions that you should have a low (1.3:1 or better) VSWR reading before using the amplifier. In practice, it probably wouldn't make much difference until at least 2:1 or better. Most modern solid-state power devices use ballasted emitter protection to guard against excessive collector current.

Performance

Check the table for performance measurements. All tests were performed using an IC-2AT with different battery packs as the exciter. Bird 43 wattmeters and a Bird Termaline dummy load were also used to measure power input and output. For receive measurements, an HP 608F with Boonton 92 millivoltmeter was employed.

Some observations regarding the data. First of all, the variance in input VSWR of each amplifier caused the power input levels themselves to vary during the power tests. This is due to the impedance mismatch as shown by the Bird 43. If the VSWR approaches 1.5:1, the impedance looks more like 75 or 37 ohms. The readings for input and output power are close to the manufacturers' specifications in each case since both specify a maximum output of 30 watts.

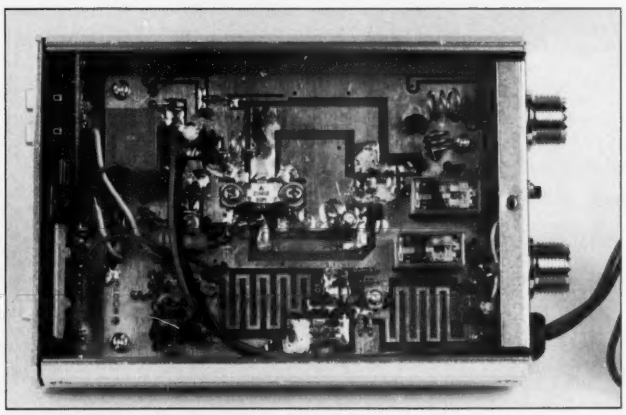


Photo C. Interior view of the THL HL-37V amp.

The pre-amplifier in the RFC2-23 didn't come close to the claimed spec of 20 dB. How-ever, 14.5 dB is more than adequate for normal FM work. The HL-37V was much closer to its rating of +14 dB, which again is more than enough for an amplifier of this type.

As far as compression tests go, the HL-37V passed with flying colors. I've stated in the past that a well-designed GaAsFET for 2 meters ought to exhibit a 1-dB compression point at better than 0-dB output, and +2 dB is fine. The RFC 2-23, however, exhibited such a poor compression characteristic that I called Ken Holladay of RF Concepts. He suspected that the Schottky diodes used to protect the GaAsFET were causing the compression, and this makes sense. Ken also suggests that users switch the preamplifier off in high-level RF areas. The manual also recommends this.

When do you know you are neara high-intensity RF field?!? It may notbe apparent, but you could be the victim of intermodulation products causedby a nearby repeater or commercial radio installation while otherwise engaged in normal point-to-point communications. This could also happenif an amateur in your neighborhoodoperated with high power on 2-meter SSB while you were on an FM simplex net, for example. From the data above,it stands that a signal level of -24 dBwill cause the preamp to go into compression. (-24 dB corresponds to about 12 millivolts, a fairly strong level but not unusual.)

Conclusions

You can place both radios into your car as you wish. Both manufacturers recommend mounting the amplifiers with the supplied brackets to allow suffi-cient airflow over the heatsink, whichwill get warm to the touch in extended FM use. Keep in mind the slider op-tion on the HL-37V. You may wishto tailor the front-end performance to suit your tastes in areas with plenty of RF.

Both of these amplifiers are of the set-it-and-forget-it variety. Just hook them up and hide them under your seat, under the dash, in the trunk, or wherever. The power output display on the HL-37V is not a guide. You'll run over 20 watts output with half a watt input and close to the maximum output with 1 watt.

Some additional thoughts: to get the most out of these amplifiers, use heavy-duty wire for the DC lines, and low-loss coax, such as Belden 9311, RG-58, or RG8X, between the amplifier and your HT. You may encounter a slight mismatch with the HL-37V and have to experiment with cable lengths. The input impedance of the RFC 2-23 is close enough to 50 Ohms, so lengths aren't critical. 73

HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	**2149**
HM-36 Scanning hand microphone	44.50	
SP-20 Ext. speaker w/audio filter	149.00	**139.95**
FL-101 250 Hz 1st IF CW filter	69.95	
FL-53A 250 Hz 2nd IF CW filter	108.00	**99.95**
FL-102 6 kHz AM filter	56.00	
EX-310 Voice synthesizer	46.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	**1399**
PS-35 Internal power supply	199.00	**179.95**
FL-32A 500 Hz CW filter (1st IF)	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

IC-735 HF transceiver/SW rcvr/mic	999.00	**869.95**
PS-55 External power supply	199.00	**179.95**
AT-150 Automatic antenna tuner	445.00	**349.95**
FL-32A 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	**1699**
PS-15 20A external power supply	169.00	**154.95**
PS-30 Systems p/s w/cord, 6-pin plug	299.00	**269.95**
MB Mobile mount, 735/751A/761A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A	63.00	
PP-1 Speaker/patch	179.00	**164.95**
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	**124.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
AT-500 500W 9-band auto. antenna tuner	559.00	**489.95**
AH-2 8-band tuner w/mount & whip	625.00	**549.95**
AH-2A Antenna tuner system, only	495.00	**429.95**
GC-5 World clock	91.95	**89.95**

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	**1049**
IC-275H 100W 2m FM/SSB/CW	1389.00	**1229**
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	**1249**

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IC-475H 75W 440 FM/SSB/CW	1599.00	**1429**
IC-575A 25W 6/10m xcvr w/ps	1399.00	**1249**

IC-471A* 25W 430-450 **CLOSEOUT**	979.00	**749.95**
PS-25 Internal power supply	115.00	**104.95**
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 **CLOSEOUT**	1399.00	**989.95**
PS-35 Internal power supply	199.00	**179.95**
AG-35* Mast mounted preamplifier	95.00	

***Preamp $9.95 with 471A or 471H Purchase**

Accessories common to 271A/H and 471A/H		
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	14.00	
UT-15S UT-15S w/TS-32 installed	92.00	

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM **CLOSEOUT**	639.00	**549.95**
IC-490A 10W 430-440 **CLOSEOUT**	699.00	**399.95**

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	**379.95**
IC-27H Compact 45W 2m FM w/TTP mic	459.00	**399.95**
IC-37A Compact 25W 220 FM, TTP mic	499.00	**439.95**
IC-47A Compact 25W 440 FM, TTP mic	549.00	**489.95**
PS-45 Compact 8A power supply	139.00	**129.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	459.00	**399.95**
IC-28H 45W 2m FM, TTP mic	489.00	**429.95**
IC-38A 25W 220 FM, TTP mic	489.00	**429.95**
IC-48A 25W 440-450 FM, TTP mic	489.00	**429.95**
HM-14 Extra TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-900 Transceiver controller	589.00	**529.95**
UX-29A 2m 25W unit	295.00	**269.95**
UX-29H 2m 45W unit	339.00	**309.95**
UX-39A 220MHz 25W unit	349.00	**319.95**
UX-49A 440MHz 25W unit	339.00	**309.95**
UX-59A 6m 10W unit	339.00	**309.95**
IC-3200A 25W 2m/440 FM w/TTP	599.00	**529.95**
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
RP-3010 440MHz 10W FM repeater	1229.00	**1089**
IC-1200 10W 1.2GHz FM Mobile	699.00	**629.95**
IC-1271A 10W 1.2GHz SSB/CW Base	1229.00	**1089**
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	**104.95**
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	**119.95**
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1479.00	**1299**
RP-2210 220MHz 25W repeater	1499.00	**1329**

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Hand-helds	Regular	SALE
IC-2A 2-meters	279.00	**249.95**
IC-2AT with TTP	299.00	**259.95**
IC-3AT 220 MHz, TTP	339.00	**299.95**
IC-4AT 440 MHz, TTP	339.00	**299.95**
IC-02AT 2-meters	365.00	**299.95**
IC-02AT/High Power	399.00	**339.95**
IC-03AT for 220 MHz	449.00	**389.95**
IC-04AT for 440 MHz	449.00	**389.95**
IC-u2A 2-meters	299.00	**269.95**
IC-u2AT with TTP	329.00	**289.95**
IC-u4AT 440 MHz, TTP	369.00	**329.95**

Accessories for micros - CALL $

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	**399.95**
A-2 5W PEP synth. aircraft HT	499.00	**449.95**
A-20 Synth. aircraft HT w/VOR	599.00	**529.95**

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for DIx using BP-3	20.50
LC-14 Vinyl case for DIx using BP-7/8	20.50
LC-02AT Leather case for DIx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or DIx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
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HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	**SALE 99.95**
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$949.00	**799.95**
RC-11 Infrared remote controller	67.25	
FL-32A 500 Hz CW filter	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	**159.95**
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EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25MHz to 2GHz scan rcvr	1099.00	**949.95**
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
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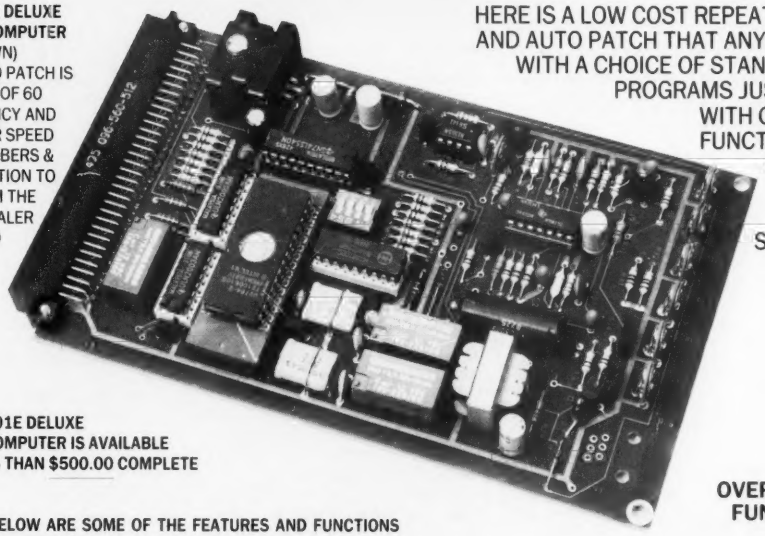

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#5 UNIVERSAL PULSE DIALER WITH ADJUSTABLE SPEED
#6 SINGLE OR MULTI DIGIT AUTO PATCH ACCESS CODE
#7 AUTO PATCH TIMER TIME OUT WARNINGS
#8 CALLER CONTROLLED REVERSE AUTO PATCH WITH USER PROGRAMMABLE ACCESS CODES
#9 EXCUENT AUTO PATCH AUDIO WITH ADJ. INPUT & OUTPUT LEVELS
#10 SMART AUTO PATCH
#11 DIAL 9 FIRST, PBX FEATURE
#12 SEPARATE REVERSE AUTO PATCH ON/OFF COMMAND
#13 COMPUTER PRINTOUT OF SPEED DIALER NUMBERS
#14 TOLL RESTRICT WITH ON/OFF COMMAND AND ADJ. MIN. AND MAX. NUMBER OF DIGITS TO BE DIALED
#15 COURTESY TONE NOTIFICATION OF A.P. STATUS
#16 USER AND EMERGENCY SPEED DIALER INHIBIT
#17 REDIAL CAPABILITY OF LAST NUMBER DIALED
#18 EXPANDABLE TO OVER 800 SPEED DIAL NUMBERS
#19 INPUT TO DISABLE AUTO PATCH WHEN LINE IS IN USE, ALLOWING MULT. USE OF PHONE LINE
#20 TRANSMITTER SHUTDOWN WITH PRESENCE OF TONE
#21 UNIQUE TONE NOTIFICATION OF A P DISCONNECT
#22 ADJUSTABLE AUTO PATCH TIME OUT TIMER
#23 DTMF TONE MUTE AND COVER TONE MASKING
#24 REPEATER TIME OUT TIMER WARNINGS
#25 PROGRAMMABLE IDENTIFIER OVER THE AIR AND OVER THE PHONE LINE
#26 SEVEN DIGIT CONTROLLER COMMAND CODES
#27 SMART CW IDENTIFIER, IDENTIFIES AFTER INPUT CARRIER DROPS AND AFTER FINAL Q50
#28 O.K. NOTIFICATION OF VALID FUNCTION CHANGE
#29 BATTERY BACKUP NOTIFICATION WITH BATTERY BACKUP CAPABILITY.
#30 CAN BE ORDERED TO USER INITIAL POWER UP FUNCTIONS AND MASTER CODE AND IT ALL WILL LISTED ON THE SUPPLIED COMPUTER PRINT OUT.
#31 BURGLAR AND FIRE ALARM INPUT WITH SPECIAL ALERT FUNCTION
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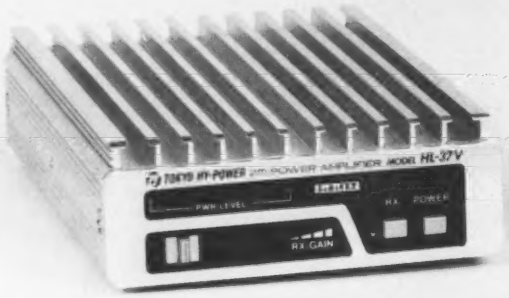
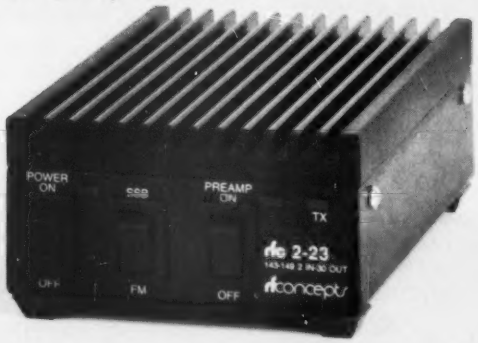
73 Review *by Pete Putman KT2B*

Power Play Comparison

RF Concepts RFC 2-23 and Tokyo Hi-Power HL-37V 30-Watt 144-MHz Power Amplifiers



Tokyo Hi-Power Labs
Subsidiary of Encomm, Inc.
1506 Capital Ave.
Plano TX 75074
Price Class: $100



RF Concepts
2000 Humboldt St.
Reno NV 89509
Price Class: $112

What would an issue about hand-helds be without a review of the most popular hand-held accessory? Here I've chosen two representative models of hand-held amplifiers (one US-made and one from Japan), each designed to take a nominal 2-watt input and amplify it about 10 dB. In addition, both feature GaAsFET preamplifiers for weak signal reception.

Background

Hand-held amplifiers aren't new. Over the past ten years design refinements have brought us from 10-watt power levels up to the current 25- and 35-watt units, which are nesting in ever-increasing numbers under car seats and in gloveboxes.

RF Concepts is a relatively new company, founded by Everett Gracey and Ken Holladay in early 1987. Both originally founded Mirage Communications in the early '80s, which was later purchased by KLM. RF Concepts offers a wide range of power amplifiers for 2 and 220 MHz, and new models for 432 MHz will appear soon. All employ GaAsFET preamplifiers.

Tokyo Hi-Power is the amplifier subsidiary of Encomm, a Texas-based importer and distributor of a wide range of VHF/UHF products, including Santec handhelds, Welz SWR meters, and Kenpro antenna rotors. They, too, have a wide range of power amplifiers to cover 144 and 432 MHz, and most of their designs use GaAsFETs.

PERFORMANCE MEASUREMENTS

Specification	*RFC 2-23*	*HL-37V*
Rf Power/DC Current: Input/Output	.3W/6W@2.0A 1.5W/25W@3.7A 2.5W/35W@4.4A	.5W/20W@3.8A 1.0W/25W@4.4A 2.0W/30W@4.6A
Measured SWR at input:	1.2:1	1.5:1
Preamplifier Gain:	14.5 dB	13.0 dB
1-dB Compression, output:	-11.0 dB	+2.0 dB

Description

Photo A shows the two amplifiers side by side. Both are small enough to stash just about anywhere. The RFC 2-23 measures 1¾" H x 3½" W x 5¾" D, and the HL-37V measures 1½" H x 4" W x 5¾" D. The RFC 2-23 is finished in a satin black, while the HL-37V comes in a brushed aluminum shade.

Front panel layouts differ somewhat. Controls for DC POWER, SSB/FM mode and PREAMP ON/OFF are rocker switches on the RFC 2-23. LEDs indicate when the amplifier is on, when the preamp is enabled, and when in transmit. On the HL-37V, pushbutton switches turn POWER on and enable the preamp, marked RX. The mode setting for SSB/FM is located on the rear panel. In addition, the HL-37V features a slider control for RX GAIN (more on this in a moment), and a bargraph LED display to show power output level.

Both radios use standard SO-239 connectors. The RFC 2-23 has a detachable DC power cord with Molex connector, while the HL-37V power cord is hard-wired. The former's power cord is somewhat heavier, using #16 wire as opposed to the #18 wire on the HL-37V. It shouldn't make much of a difference if you install with the supplied cords. Failing that you should use heavier wire where possible (#16 or better).

Photo B shows the interior of the RFC 2-23. The power device is a Motorola SRF3961, which works in a 12-dB configuration. Work-

manship is of the highest quality, and there are only two tuned circuits using ARCO trimmers. The design is very similar to Mirage amplifiers, as you might expect. RF-sensed keying is used exclusively, with the SSB/FM switch setting the drop-out delay. This is largely due to the primary market for these amplifiers, FM hand-held users. Protective diodes are used around the GaAs FET, a CF300 device with nominally 20-dB gain at a noise figure of about 1 dB. In addition, an automatic SWR protection circuit will kick in at about 3:1 VSWR. RF Concepts rates the maximum RF input at 5 watts, which I could not verify. Minimum input is specified at 200 mW, with approximately 30 watts output for 2 watts drive.

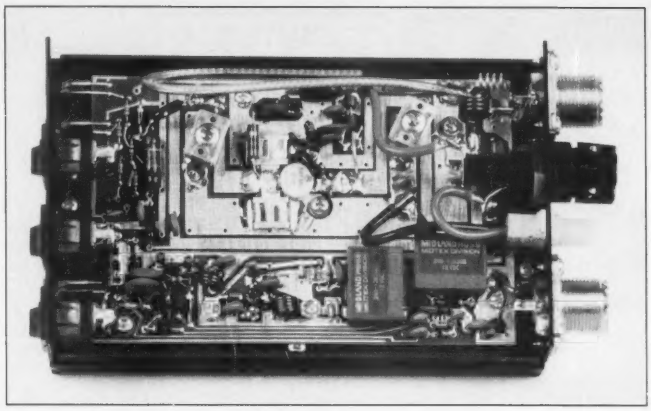


Photo B. Interior view of the RFC 2-23 amp.

Photo C shows the inside of the HL-37V. The active device is a 2SC1946A, also running about 10–12 dB gain. The amplifier does not use tuned circuits, but rather etched inductors and small fixed-value capacitors. Workmanship here is also very high quality. The PC layout is considerably more open than the RFC 2-23, but this is no comment on the engineering design.

The unit also uses RF VOX keying on both SSB and FM modes. No other provision is made for hard-keying, again for the reason that the majority of buyers will operate FM only. A 3SK121 GaAsFET provides a nominal +14 dB gain, and a unique slider control allows continuous adjustment of the RX gain from -20 dB to +14 dB. Protective diodes also isolate the GaAsFET.

Why the slider? Apparently in some places in Japan, there is so much RF on and near the 2-meter band that preamps tend to go berserk in the intense RF fields. The average unaided front end of a hand-held is similarly affected, so having a variable attenuator is a great help!

In practice, the adjustment to give unity gain is nearly 80% of full setting.

In contrast to the RFC 2-23, the Japanese unit affords no no VSWR protection. The manual strongly cautions that you should have a low (1.3:1 or better) VSWR reading before using the amplifier. In practice, it probably wouldn't make much difference until at least 2:1 or better. Most modern solid-state power devices use ballasted emitter protection to guard against excessive collector current.

Performance

Check the table for performance measurements. All tests were performed using an IC-2AT with different battery packs as the exciter. Bird 43 wattmeters and a Bird Termaline dummy load were also used to measure power input and output. For receive measurements, an HP 608F with Boonton 92 millivoltmeter was employed.

Some observations regarding the data. First of all, the variance in input VSWR of each amplifier caused the power input levels themselves to vary during the power tests. This is due to the impedance mismatch as shown by the Bird 43. If the VSWR approaches 1.5:1, the impedance looks more like 75 or 37 ohms. The readings for input and output power are close to the manufacturers' specifications in each case since both specify a maximum output of 30 watts.

The pre-amplifier in the RFC2-23 didn't come close to the claimed spec of 20 dB. How-ever, 14.5 dB is more than adequate for normal FM work. The HL-37V was much closer to its rating of +14 dB, which again is more than enough for an amplifier of this type.

As far as compression tests go, the HL-37V passed with flying colors. I've stated in the past that a well-designed GaAsFET for 2 meters ought to exhibit a 1-dB compression point at better than 0-dB output, and +2 dB is fine. The RFC 2-23, however, exhibited such a poor compression characteristic that I called Ken Holladay of RF Concepts. He suspected that the Schottky diodes used to protect the GaAsFET were causing the compression, and this makes sense. Ken also suggests that users switch the preamplifier off in high-level RF areas. The manual also recommends this.

When do you know you are neara high-intensity RF field?!? It may notbe apparent, but you could be the victim of intermodulation products causedby a nearby repeater or commercial radio installation while otherwise engaged in normal point-to-point communications. This could also happenif an amateur in your neighborhoodoperated with high power on 2-meter SS3 while you were on an FM simplex net, for example. From the data above,it stands that a signal level of -24 dBwill cause the preamp to go into compression. (-24 dB corresponds to about 12 millivolts, a fairly strong level but not unusual.)

Conclusions

You can place both radios into your car as you wish. Both manufacturers recommend mounting the amplifiers with the supplied brackets to allow suffi-cient airflow over the heatsink, whichwill get warm to the touch in extended FM use. Keep in mind the slider op-tion on the HL-37V. You may wishto tailor the front-end performance to suit your tastes in areas with plenty of RF.

Both of these amplifiers are of the set-it-and-forget-it variety. Just hook them up and hide them under your seat, under the dash, in the trunk, or wherever. The power output display on the HL-37V is not a guide. You'll run over 20 watts output with half a watt input and close to the maximum output with 1 watt.

Some additional thoughts: to get the most out of these amplifiers, use heavy-duty wire for the DC lines, and low-loss coax, such as Belden 9311, RG-58, or RG8X, between the amplifier and your HT. You may encounter a slight mismatch with the HL-37V and have to experiment with cable lengths. The input impedance of the RFC 2-23 is close enough to 50 Ohms, so lengths aren't critical. 73

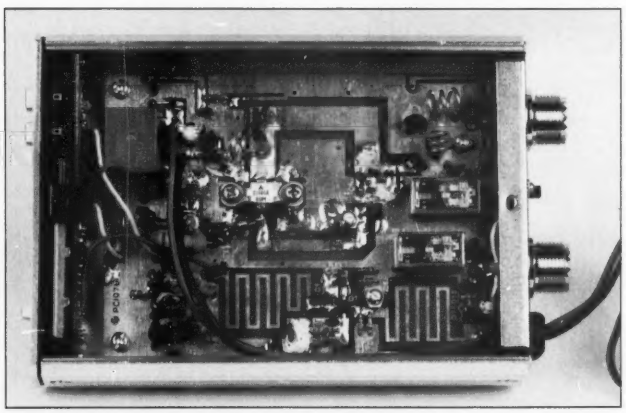


Photo C. Interior view of the THL HL-37V amp.

HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	**2149**
HM-36 Scanning hand microphone	44.50	
SP-20 Ext. speaker w/audio filter	149.00	**139.95**
FL-101 250 Hz 1st IF CW filter	69.95	
FL-53A 250 Hz 2nd IF CW filter	108.00	**99.95**
FL-102 6 kHz AM filter	56.00	
EX-310 Voice synthesizer	46.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	**1399**
PS-35 Internal power supply	199.00	**179.95**
FL-32A 500 Hz CW filter (1st IF)	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

IC-735 HF transceiver/SW rcvr/mic	999.00	**869.95**
PS-55 External power supply	199.00	**179.95**
AT-150 Automatic antenna tuner	445.00	**349.95**
FL-32A 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	**1699**
PS-15 20A external power supply	169.00	**154.95**
PS-30 Systems p/s w/cord, 6-pin plug	299.00	**269.95**
MB Mobile mount, 735/751A/761A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A	63.00	
PP-1 Speaker/patch	179.00	**164.95**
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	**124.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
AT-500 500W 9-band auto. antenna tuner	559.00	**489.95**
AH-2 8-band tuner w/mount & whip	625.00	**549.95**
AH-2A Antenna tuner system, only	495.00	**429.95**
GC-5 World clock	91.95	**89.95**

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	**1049**
IC-275H 100W 2m FM/SSB/CW	1389.00	**1229**
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	**1249**

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IC-475H 75W 440 FM/SSB/CW	1599.00	**1429**
IC-575A 25W 6/10m xcvr w/ps	1399.00	**1249**

IC-471A* 25W 430-450	**CLOSEOUT**	979.00 **749.95**
PS-25 Internal power supply		115.00 **104.95**
AG-1* Mast mounted preamplifier		99.50
IC-471H* 75W 430-450	**CLOSEOUT**	1399.00 **989.95**
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AG-35* Mast mounted preamplifier		95.00

***Preamp $9.95 with 471A or 471H Purchase**

Accessories common to 271A/H and 471A/H	
SM-6 Desk microphone	44.95
EX-310 Voice synthesizer	46.00
TS-32 CommSpec encode/decoder	59.95
UT-15 Encoder/decoder interface	14.00
UT-15S UT-15S w/TS-32 installed	92.00

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM	**CLOSEOUT**	639.00 **549.95**
IC-490A 10W 430-440	**CLOSEOUT**	699.00 **399.95**

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	**379.95**
IC-27H Compact 45W 2m FM w/TTP mic	459.00	**399.95**
IC-37A Compact 25W 220 FM, TTP mic	499.00	**439.95**
IC-47A Compact 25W 440 FM, TTP mic	549.00	**489.95**
PS-45 Compact 8A power supply	139.00	**129.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	459.00	**399.95**
IC-28H 45W 2m FM, TTP mic	489.00	**429.95**
IC-38A 25W 220 FM, TTP mic	489.00	**429.95**
IC-48A 25W 440-450 FM, TTP mic	489.00	**429.95**
HM-14 Extra TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-900 Transceiver controller	589.00	**529.95**
UX-29A 2m 25W unit	295.00	**269.95**
UX-29H 2m 45W unit	339.00	**309.95**
UX-39A 220MHz 25W unit	349.00	**319.95**
UX-49A 440MHz 25W unit	339.00	**309.95**
UX-59A 6m 10W unit	339.00	**309.95**
IC-3200A 25W 2m/440 FM w/TTP	599.00	**529.95**
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
RP-3010 440MHz 10W FM repeater	1229.00	**1089**
IC-1200 10W 1.2GHz FM Mobile	699.00	**629.95**
IC-1271A 10W 1.2GHz SSB/CW Base	1229.00	**1089**
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	**104.95**
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	**119.95**
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1479.00	**1299**
RP-2210 220MHz 25W repeater	1499.00	**1329**

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Hand-helds	Regular	SALE
IC-2A 2-meters	279.00	**249.95**
IC-2AT with TTP	299.00	**259.95**
IC-3AT 220 MHz, TTP	339.00	**299.95**
IC-4AT 440 MHz, TTP	339.00	**299.95**
IC-02AT 2-meters	365.00	**299.95**
IC-02AT/High Power	399.00	**339.95**
IC-03AT for 220 MHz	449.00	**389.95**
IC-04AT for 440 MHz	449.00	**389.95**
IC-u2A 2-meters	299.00	**269.95**
IC-u2AT with TTP	329.00	**289.95**
IC-u4AT 440 MHz, TTP	369.00	**329.95**

Accessories for micros - CALL $

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	**399.95**
A-2 5W PEP synth. aircraft HT	499.00	**449.95**
A-20 Synth. aircraft HT w/VOR	599.00	**529.95**

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for DIx using BP-3	20.50
LC-14 Vinyl case for DIx using BP-7/8	20.50
LC-02AT Leather case for DIx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or DIx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
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CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25MHz to 2GHz scan rcvr	1099.00	**949.95**
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TV-R7000 ATV unit	131.95	**119.95**
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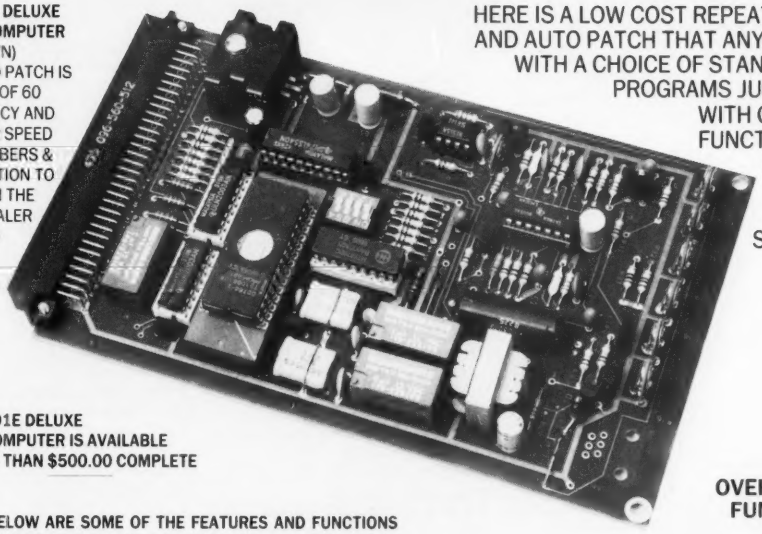
Hi Pro HPC201 MICROPROCESSOR REPEATER CONTROLLER & AUTO PATCH

HPC201E DELUXE MICRO COMPUTER (AS SHOWN) THE AUTO PATCH IS CAPABLE OF 60 EMERGENCY AND 300 USER SPEED DIAL NUMBERS & INFORMATION TO PROGRAM THE SPEED DIALER SUPPLIED WITH ORDER.



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THE HP201E DELUXE MICRO COMPUTER IS AVAILABLE FOR LESS THAN $500.00 COMPLETE

OVER 80 USER FUNCTIONS

LISTED BELOW ARE SOME OF THE FEATURES AND FUNCTIONS OF THE HP201E DELUXE CONTROLLER & AUTO PATCH

#1 MICROPROCESSOR CONTROL WITH 16 DIGIT DECODER
#2 USER PROGRAMMABLE CODES BY RADIO OR TELEPHONE
#3 USER PROGRAMMABLE I.D. BY RADIO OR TELEPHONE
#4 REPEATER RINGUP AUTO PATCH WITH ON OFF CODES
#5 UNIVERSAL PULSE DIALER WITH ADJUSTABLE SPEED
#6 SINGLE OR MULTI DIGIT AUTO PATCH ACCESS CODE
#7 AUTO PATCH TIMER TIME OUT WARNINGS
#8 CALLER CONTROLLED REVERSE AUTO PATCH WITH USER PROGRAMMABLE ACCESS CODES
#9 EXCUENT AUTO PATCH AUDIO WITH ADJ. INPUT & OUTPUT LEVELS
#10 SMART AUTO PATCH
#11 DIAL 9 FIRST, PBX FEATURE
#12 SEPARATE REVERSE AUTO PATCH ON/OFF COMMAND
#13 COMPUTER PRINTOUT OF SPEED DIALER NUMBERS
#14 TOLL RESTRICT WITH ON/OFF COMMAND AND ADJ. MIN. AND MAX. NUMBER OF DIGITS TO BE DIALED
#15 COURTESY TONE NOTIFICATION OF A.P. STATUS
#16 USER AND EMERGENCY SPEED DIALER INHIBIT
#17 REDIAL CAPABILITY OF LAST NUMBER DIALED
#18 EXPANDABLE TO OVER 800 SPEED DIAL NUMBERS
#19 INPUT TO DISABLE AUTO PATCH WHEN LINE IS IN USE, ALLOWING MULT. USE OF PHONE LINE
#20 TRANSMITTER SHUTDOWN WITH PRESENCE OF TONE
#21 UNIQUE TONE NOTIFICATION OF A P DISCONNECT
#22 ADJUSTABLE AUTO PATCH TIME OUT TIMER
#23 DTMF TONE MUTE AND COVER TONE MASKING
#24 REPEATER TIME OUT TIMER WARNINGS
#25 PROGRAMMABLE IDENTIFIER OVER THE AIR AND OVER THE PHONE LINE
#26 SEVEN DIGIT CONTROLLER COMMAND CODES
#27 SMART CW IDENTIFIER, IDENTIFIES AFTER INPUT CARRIER DROPS AND AFTER FINAL Q50
#28 O.K. NOTIFICATION OF VALID FUNCTION CHANGE
#29 BATTERY BACKUP NOTIFICATION WITH BATTERY BACKUP CAPABILITY.
#30 CAN BE ORDERED TO USER INITIAL POWER UP FUNCTIONS AND MASTER CODE AND IT ALL WILL LISTED ON THE SUPPLIED COMPUTER PRINT OUT.
#31 BURGLAR AND FIRE ALARM INPUT WITH SPECIAL ALERT FUNCTION
#32 SEVEN 500 MA OPEN COLLECTOR CONTROLLER OUTPUTS
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CIRCLE 47 ON READER SERVICE CARD

NEW! CB Radios & Scanners

Communications Electronics,™ the world's largest distributor of radio scanners, introduces new models of CB & marine radios and scanners.

NEW! Regency® TS2-RA

Allow 30-90 days for delivery after receipt of order due to the high demand for this product.

List price $499.95/**CE price $339.95**

12-Band, 75 Channel • Crystalless • AC/DC

Frequency range: 29-54, 118-175, 406-512, 806-950 MHz.

The *Regency* TS2 scanner lets you monitor Military, Space Satellites, Government, Railroad, Justice Department, State Department, Fish & Game, Immigration, Marine, Police and Fire Departments, Aeronautical AM band, Paramedics, Amateur Radio, plus thousands of other radio frequencies most scanners can't pick up. The *Regency* TS2 features new 40 channel per second *Turbo Scan*™ so you wont miss any of the action. Model **TS1-RA** is a 35 channel version of this radio without the 800 MHz. band and costs only $239.95.

Regency® Z60-RA

List price $299.95/**CE price $148.95/SPECIAL**

8-Band, 60 Channel • No-crystal scanner

Bands: 30-50, 88-108, 118-136, 144-174, 440-512 MHz.

The *Regency* Z60 covers all the public service bands plus aircraft and FM music for a total of eight bands. The Z60 also features an alarm clock and priority control as well as AC/DC operation. Order today.

Regency® Z45-RA

List price $259.95/**CE price $139.95/SPECIAL**

7-Band, 45 Channel • No-crystal scanner

Bands: 30-50, 118-136, 144-174, 440-512 MHz.

The *Regency* Z45 is very similar to the Z60 model listed above however it does not have the commercial FM broadcast band. The Z45, now at a special price from Communications Electronics.

Regency® RH256B-RA

List price $799.95/**CE price $329.95/SPECIAL**

16 Channel • 25 Watt Transceiver • Priority

The *Regency* RH256B is a sixteen-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to 16 frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH256 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH606B-RA** is available for $459.95. A UHF 15 watt, 10 channel version of this radio called the **RU150B-RA** is also available and covers 450-482 MHz. but the cost is $439.95.

Bearcat® 50XL-RA

List price $199.95/**CE price $114.95/SPECIAL**

10-Band, 10 Channel • Handheld scanner

Bands: 29.7-54, 136-174, 406-512 MHz.

The *Uniden Bearcat* 50XL is an economical, handheld scanner with 10 channels covering ten frequency bands. It features a keyboard lock switch to prevent accidental entry and more. Also order the new double-long life rechargeable battery pack part # **BP55** for $29.95, a plug-in wall charger, part # **AD100** for $14.95, a carrying case part # **VC001** for $14.95 and also order optional cigarette lighter cable part # **PS001** for $14.95.

PC 22

NEW! Scanner Frequency Listings

The new Fox scanner frequency directories will help you find all the action your scanner can listen to. These new listings include police, fire, ambulances & rescue squads, local government, private police agencies, hospitals, emergency medical channels, news media, forestry radio service, railroads, weather stations, radio common carriers, AT&T mobile telephone, utility companies, general mobile radio service, marine radio service, taxi cab companies, tow truck companies, trucking companies, business repeaters, business radio (simplex) federal government, funeral directors, veterinarians, buses, aircraft, space satellites, amateur radio, broadcasters and more. Fox frequency listings feature call letter cross reference as well as alphabetical listing by licensee name, police codes and signals. All Fox directories are $14.95 each plus $3.00 shipping. State of Alaska–**RL019-1**; Baltimore, MD/Washington, DC–**RL024-1**; Chicago, IL–**RL014-1**; Cleveland, OH–**RL017-1**; Columbus, OH–**RL003-2**; Dallas/Ft. Worth, TX–**RL013-1**; Denver/Colorado Springs, CO–**RL027-1**; Detroit, MI/ Windsor, ON–**RL008-2**; Fort Wayne, IN /Lima, OH– **RL001-1**; Houston, TX–**RL023-1**; Indianapolis, IN–**RL022-1**; Kansas City, MO/ KS–**RL011-2**; Los Angeles, CA–**RL016-1**; Louisville/Lexington, KY–**RL007-1**; Milwaukee, WI/Waukegan, IL–**RL021-1**; Minneapolis/St. Paul, MN–**RL010-2**; Nevada/E. Central CA–**RL028-1**; Oklahoma City/Lawton, OK–**RL005-2**; Pittsburgh, PA/Wheeling, WV–**RL029-1**; Rochester/ Syracuse, NY–**RL020-1**; Tampa/St. Petersburg, FL–**RL004-2**; Toledo, OH–**RL002-3**. A regional directory which covers police, fire ambulance & rescue squads, local government, forestry, marine radio, mobile phone, aircraft and NOAA weather is available for $19.95 each. **RD001-1** covers AL, AR, FL, GA, LA, MS, NC, PR, SC, TN & VI. For an area not shown above call Fox at 800-543-7892 or in Ohio 800-621-2513.

Regency® Informant™ Scanners

Frequency coverage: 35-54, 136-174 406-512 MHz.

The new *Regency* Informant scanners cover virtually all the standard police, fire, emergency and weather frequencies. These special scanners are preprogrammed by state in the units memory. Just pick a state and a category. The Informant does the rest. All Informant radios have a feature called *Turbo Scan*™ to scan up to 40 channels per second. The **INF1-RA** is ideal for truckers and is only $249.95. The new **INF2-RA** is a deluxe model and has ham radio, a weather alert and other exciting features built in for only $324.95. For base station use, the **INF5-RA** is only $199.95 and for those who can afford the best, the **INF3-RA** at $249.95, is a state-of-the-art, receiver that spells out what service you're listining to such as Military, Airphone, Paging, State Police, Coast Guard or Press.

Regency® HX1500-RA

List price $369.95/**CE price $218.95**

11-Band, 55 Channel • Handheld/Portable Search • Lockout • Priority • Bank Select Sidelit liquid crystal display • EAROM Memory Direct Channel Access Feature • Scan delay

Bands: 29-54, 118-136, 144-174, 406-420, 440-512 MHz.

The new handheld *Regency* HX1500 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 55 channels at the same time including the AM aircraft band. The LCD display is even sidelit for night use. Includes belt clip, flexible antenna and earphone. Operates on 8 1.2 Volt rechargeable Ni-cad batteries (not included). Be sure to order batteries and battery charger from the accessory list in this ad.

Bearcat® 100XL-RA

List price $349.95/**CE price $178.95/SPECIAL**

9-Band, 16 Channel • Priority • Scan Delay Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 118-174, 406-512 MHz.

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

★★★ *Uniden CB Radios* ★★★

The *Uniden* line of Citizens Band Radio transceivers is styled to compliment other mobile audio equipment. Uniden CB radios are so reliable that they have a two year limited warranty. From the feature packed PRO 540e to the 310e handheld, there is no better Citizens Band radio of the market today.

PRO310E-RA *Uniden* 40 Ch. Portable/Mobile CB . . . $85.95
NINJA-RA PRO310E with rechargeable battery pack.$99.95
B-10-RA 1.2V AA Ni-cad batt. for Ninja (set of 10) $20.95
PRO520E-RA *Uniden* 40 channel CB Mobile $59.95
PRO540E-RA *Uniden* 40 channel CB Mobile. $119.95
PRO710E-RA *Uniden*40 channel CB Base $119.95
PC22-RA *Uniden* remote mount CB Mobile $99.95
PC55-RA *Uniden*mobile mount CB transceiver. $59.95

★★★ *Uniden Marine Radios* ★★★

Now the finest marine electronics are available through CEI. The *Unimetrics* **SH66-RA** has 50 transmit and 60 receive frequencies with 25 or 1 watt power output. Only $169.95. The *Unimetrics* **SH88-RA** is a deluxe full function marine radiotelephone featuring 55 transmit and 90 receive channels and scanning capability for only $259.95. The *Unimetrics* **SH3000-RA** is an excellent digital depth sounder, good for 300 feet. It has an LCD continuously backlit with red light display and a 5 ft. or 10 ft. alarm. Only $189.95. Order today.

Bearcat® 800XLT-RA

List price $499.95/**CE price $289.95/SPECIAL**

12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC

Bands: 29-54, 118-174, 406-512, 806-912 MHz.

The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½."

OTHER RADIOS AND ACCESSORIES

Panasonic RF-2600-RA Shortwave receiver $179.95
RD55-RA *Uniden* Visor mount Radar Detector $98.95
RD9-RA *Uniden* "Passport" size Radar Detector . . . $169.95
***NEW!* BC 70XLT-RA** *Bearcat* 20 channel scanner . . . $168.95
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BC 145XL-RA *Bearcat* 16 channel scanner. $98.95
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BC 210XLT-RA *Bearcat* 40 channel scanner. $196.95
BC-WA-RA *Bearcat* Weather Alert™ $35.95
R1080-RA *Regency* 30 channel scanner $118.95
R1090-RA *Regency* 45 channel scanner $148.95
UC102-RA *Regency* VHF 2 ch. 1 Watt transceiver . . . $117.95
P1412-RA *Regency* 12 amp reg. power supply . . . $189.95
MA549-RA Drop-in charger for HX1200 & HX1500 . . . $84.95
MA518-RA Wall charger for HX1500 scanner $14.95
MA553-RA Carrying case for HX1500 scanner $19.95
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MA917-RA Ni-Cad battery pack for HX1000/1200 . . . $34.95
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TIC-RA Techniques for Intercepting Comm. $14.95
RRF-RA Railroad frequency directory. $14.95
EEC-RA Embassy & Espionage Communications . . . $14.95
CIE-RA Covert Intelligenct, Elect. Eavesdropping . . . $14.95
MFF-RA Midwest Federal Frequency directory $14.95
A60-RA Magnet mount mobile scanner antenna. . . $35.95
A70-RA Base station scanner antenna. $35.95
MA548-RA Mirror mount Informant antenna. $39.95
USAMM-RA Mag mount VHF ant. w/ 12' cable. $39.95
USAK-RA ¾" hole mount VHF ant. w/ 17' cable. . . . $35.95

Add $3.00 shipping for all *accessories* ordered at the same time.
Add $12.00 shipping per shortwave receiver.
Add $7.00 shipping per radio and $3.00 per antenna.

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To ***get the fastest delivery from CE*** of any scanner, send or phone your order directly to our Scanner Distribution Center.™ Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. Ann Arbor, Michigan. No COD's. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. Non-certified checks require bank clearance. Not responsible for typographical errors.

Mail orders to: Communications Electronics,™ Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $7.00 per scanner for R.P.S./U.P.S. *ground* shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are three times continental U.S. rates. If you have a Discover, Visa or Master Card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-USA-SCAN. In Canada, order toll-free by calling 800-221-3475. FTCC Telex anytime, dial 825333. If you are outside the U.S. or in Michigan dial 313-973-8888. Order today.

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CIRCLE 121 ON READER SERVICE CARD

DEALERS
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Selling *73 Amateur Radio* will make money for you. Consider the facts:

- If you carry *73 Amateur Radio* it will increase your store traffic—and our dealers tell us that *73* is the hottest selling amateur radio magazine on the newsstands today.
- Increased store traffic means increased sales for you. Hams will come into your store to pick up the latest *73* and end up buying the latest all-band, all-mode transceiver (or at least a few feet of coax).
- *73 Amateur Radio* guarantees each issue—you pay only for the copies that you sell. We pay for all shipping.

For information on selling *73 Amateur Radio*, call Peter Murphy at **800-722-7790**, or write to *73 Amateur Radio*, WGE Center, Peterborough, NH 03458.

73 Amateur Radio

WGE Center, Peterborough, NH 03458 800-722-7790

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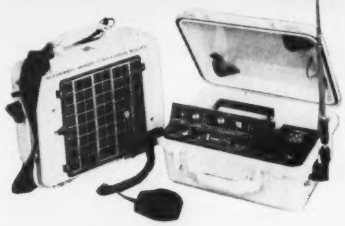
IT'S THE VECTOR VR-50 SSB COMMUN CATOR



Finally there is an affordable powerful (50 W) solar powered HF-SSB transceiver for the Amateur. Works anywhere—easily deployed antenna system—built in antenna tuner—stable crystal controlled circuitry on any amateur, MARS or CAP frequency (SSB or CW) from 1.8 to 17 mHz (except 4.7-5.1)—all in a bright yellow unsinkable housing/carrying case. Many optional accessories. System available now!

Call or write for a fully detailed brochure on the unique VECTOR VR-50 today.

This equipment is currently available through

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Garden Grove, Calif. 92640
(714) 638-8807

Note: This equipment is currently being offered for use on the amateur radio bands. A type accepted model is expected to become available before the year's end. Unlicensed use outside the amateur bands could result in imprisonment, monetary forfeitures or both. However, in an emergency involving the safety of life or property, rules may be waived at the discretion of the Federal Comm. Commision.

CIRCLE 243 ON READER SERVICE CARD

GLB PACKET RADIO GOES PORTABLE

THE FIRST CONTROLLER DESIGNED FOR PORTABLE AND SOLAR-POWERED STATIONS

- LOW 25 mA Current Drain.
- Miniature size - Lightweight.
- Rugged metal, shielded case.
- Lithium Battery backup for RAM.
- Onboard Watchdog for reliability.
- Standard DB25 Connectors.
- "Connected" Status output line.
- Remote Commands in Unattended Mode with Hardware Lockout.
- Retains all other PK-1 features.
- Extra I/O lines for special applications.

NEW SOFTWARE FEATURE:
INTELLIGENT "BUDLIST" - Provides selective callsign filtering for Digipeating, Monitoring and Connecting.

Model PK1-L
Wired/Tested
List price—$209.95
Amateur net—$179.95

Power requirement: 9 to 15 Volts DC @ 25 mA typical
Dimensions: 4.6 X 5.9 X 1.0 inches **Total Weight:** 12 ozs.

Please specify Call Sign, SSID Number, and Node Number when ordering.

Contact GLB for additional info and available options.
We offer a complete line of transmitters and receivers, strips, preselector preamps, CWID'ers & synthesizers for amateur & commercial use.
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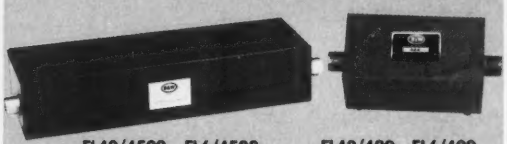
CIRCLE 17 ON READER SERVICE CARD

T.V.I. problems?

Low pass T.V.I. filters from Barker & Williamson



FL10/1500 FL6/1500 FL10/100 FL6/100

Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
FL10/1500	1000	34 MHz	52 MHz	70 db	1.8 - 30 MHz	$32.00*
FL10/100	100	44 MHz	57 MHz	60 db	1.8 - 30 MHz	$22.50*
FL6/1500	1000	55 MHz	63 MHz	70 db	6 meter	$36.00*
FL6/100	100	55 MHz	63 MHz	50 db	6 meter	$25.00*

All above to match 50 ohm transmitters and antennas.

*Add $2 shipping and handling

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CIRCLE 53 ON READER SERVICE CARD

Number 27 on your Feedback card

NEW PRODUCTS

Compiled by Rebecca Niemela

MIDLAND LMR

Midland LMR has introduced new **Wideband Frequency-Synthesized Two-Way FM Portable Radios (Model 70-254)** that cover up to 30 MHz, at full rate specifications, without returning. The portables can be programmed by an authorized technician for up to 16 channels. The new wideband Midland portables have built-in programmable tone-coded squelch, DTMF signaling and channel scanning capability. Controlled from a front key-panel, the radios can scan 20 channels per second with choice of priority and carrier, CTCSS or open channel scanning. A mode-lock key on the panel keeps the portable configured as the user sets it up. The units have diecast chassis with metal back-plates and weather-resistant seals. The price for the New Wideband 16 Channel UHF Portable Radio (Model 70-254) is $700.

Options include a 1000 mAh battery pack, chargers, a speaker-microphone, belt clips, cases and a variety of signaling formats.

For more information contact Midland LMR, Marketing Department, 1690 N. Topping, Kansas City MO 64120 (800/643-5263 X-1690). Or circle Reader Service Card #201.

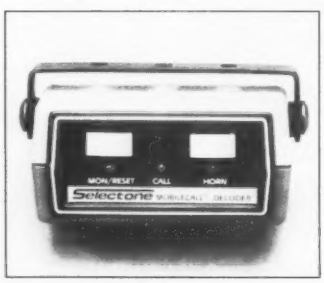
Midland's Model 70-254 two-way FM portable radio.

SELECTONE

Selectone Corporation is announcing its new **ST-216 Mobilecall decoder. It was initially** developed for GE, but it now replaces both the ST-215 Two-Tone Sequential and the ST-121 Burst Tone decoders in the Selectone line. Employing the same dash-mounted control head as the ST-215 and ST-121, the new ST-216 is compatible with *any* two-tone format including Motorola Quick-Call II, GE Type 99, Reach, and Plectron, with all functional outputs required for most selective calling applications. The new Mobilecall Universal Decoder offers field selectable frequency range, tone timing and intertone interval, compatible with all known two-tone sequential formats, and can also perform as a Burst (single) Tone decoder. The user has the choice of extended tone 1 or tone 2 for group call applications. The decoder will operate on any frequency between 275 and 3000 Hz and is field tunable.

In operation, the ST-216 mutes the speaker to block out unwanted traffic until it receives the correct tone code. Then, a latched relay output unmutes the speaker, sounds a field-selectable momentary or continuous alert buzzer, and turns on a front-panel LED indicator. The user may opt to select a horn mode which causes a 3-second horn beep. The Mobilecall Universal Decoder can be reset by an off-hook condition or by punching the Reset/Monitor switch on the control panel. The new ST-216, backed by a 5-year parts and labor warranty, is $119.

More information is available from Selectone Corporation, 23278 Bernhardt Street, Hayward CA 94545; 415-887-1950. Or any of the authorized Selectone distributors. Circle Reader Service Card number 202.



ST-216 Selectone universal two-tone decoder.

DAVLE TECH

This Personal Grounding Wrist Strap is an essential part of static-proofing the electronic work station for assembly workers and laboratory personnel. It protects sensitive devices from static charges generated by the operator.

The most important feature of this wrist strap is that it is suitable for any size wrist. The coil cord offers oxidation prevention, 6 ft., 360° swivel and high function resistor. A strong grip banana plug and crocodile clip provide sure grounding. $9.

More information is available from Davle Tech Inc., 2-05 Banta Place, Fair Lawn NJ 07410 (201/796-1720). Or circle Reader Service Card #220.

Ergotron Engineering Workstation.

LUDVIGSON TONEGEN

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Contact David Ludvigson, 415 N. Duluth, Sioux Falls, SD 57104 for more information.

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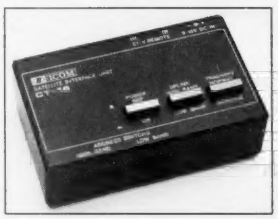
Ergotron announces availability of the **Ergotron Engineering Workstation**, a suspended radial arm computer workstation designed to reclaim useable desk space by suspending the monitor and the processor above the work surface. If there isn't desk space to organize work and lay out projects, the system's effectiveness is limited. The new Ergotron Engineering Workstation takes a totally new approach to workstation ergonomics. This free-standing workstation sits alongside your desk and provides a unique arm suspension system and shelf area giving the operator the ultimate in system adjustability and space savings. This unique combination of arm and mechanism allows the user to move up to an 80 lb. monitor to any position with just a touch of the hand. The Workstation improves operator comfort by reducing glare and eye, neck and back strain and provides for far better utilization of available desk space. This combination of benefits will result in dramatic improvement in operator productivity. The suggested retail price for the Ergotron Engineering Workstation is $500.

For more information contact Ergotron, Inc., 1621 East 79th Street, Minneapolis MN 55420 (800/328-9839 or 612/854-9116). Circle Reader Service Card #204.



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For more information circle Reader Service Card #205 or contact ICOM America, Inc., 2380-116 Ave. NE, Bellevue WA 98009 (206-454-8155).

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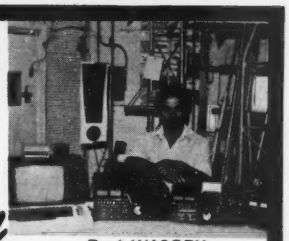

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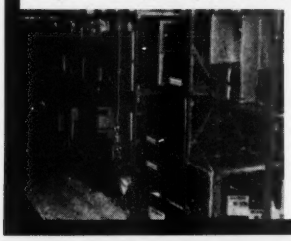

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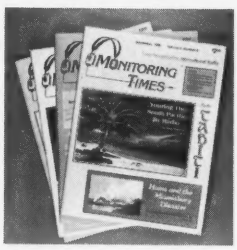

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The Banker

An Accessory for the Kenwood TS-940S/AT

by Paul D.A. Hoang NA1A

Inventron Labs
PO Box 1881
Brookline MA 02146
Price: $50

I just love my Kenwood TS-940S/AT. And from what I hear on the air, lots of people feel the same way. It seems like 25 percent of those I work on 20 meters are using one! The design of the '940 is superb in every way except one. And the "Banker" overcame this deficiency.

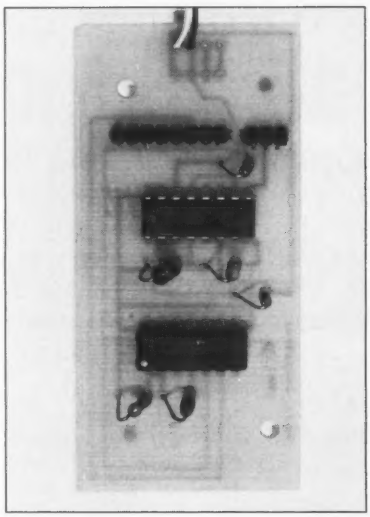
Although the radio itself has four banks of 10 memory channels (total of 40 memories) that store both frequency and mode, I suspect most people use only one bank. Why? Because the switch for changing banks is located under a sliding cover on top of the radio—along with such seldom-used controls as the VOX gain and FM mic gain! It's just too much hassle to get to the switch, and I was concerned about bumping the other controls. Besides, until recently, the rig sat on a desk with a shelf directly over the cover, so I couldn't even get to the switch. I just left the rig on bank 1 and sacrificed the other memories. No doubt most of the other '940 owners do the same thing.

I work several modes, including RTTY and AMTOR. I was always frustrated by insufficient memory to store all the frequencies I use. When an ad appeared for The Banker, I jumped at the chance to retrieve the other 30 memories for $50.

The product is a small board that mounts inside the rig in place of Kenwood's voice synthesizer option. Usually, the voice synthesizer is used only by sight-impaired hams—most of us don't have one. Once installed, the Banker lets you change memory banks by pressing the voice switch on the '940's front panel. This is especially convenient, because the voice switch happens to be right next to the memory buttons.

Installation

The unit couldn't be easier to install. It comes with extremely detailed instructions, including both schematic and pictorial diagrams. The manufacturer even tells you how to orient the rig and where to put the screws as you work. The board goes in without a hitch. Two supplied screws secure the board, which is then plugged into the two connectors normally used for the voice synthesizer.



The Banker offers easy access to the TS-940S/AT's memory.

There is one other plug on the end of a short wire, and it connects to one in the radio about two inches from the board. This plug had me puzzled at first. It's a two-pin right-angle thing I've never seen before. It snaps into the rig's connector in an odd way, paralleling the existing wires. All together, I took about ten minutes to install the board, and the radio did not require any other changes.

Before using the product, you should set the rig's bank switch to bank 4. This lets the Banker take over and is explained in the instructions. I set my switch, closed the cover (forever!) and I was in business! Now, when I press the voice button, the memory bank advances by one each time, just as if I had moved the bank switch up a notch.

Although I don't record shortwave broadcasts, the instructions tell how to use the rig's bank switch to preset a memory for timer recording. Even though the Banker is installed, you can still use the old bank switch settings. This clever trick lets you preset the rig so the Banker doesn't have to use any backup power to remember which bank you want to appear upon power-up.

Notes

I can't find anything negative about this product. It is simple, effective, and easy to use. It is all CMOS, so it takes practically no power when the rig is on, and none at all when it is off. I can remove it, should I ever want to, just as easily as I installed it. It comes with a one-year warranty, so I'm not worried about failure.

At last, I have easy access to all four memory banks. Inventron Labs has filled a gap, giving me convenient and complete use of all my '940's features. Now, if I could only get it to call "CQ" for me... 73

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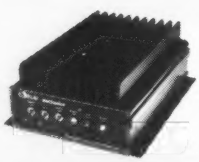

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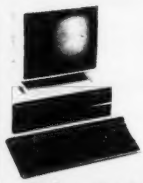

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FEATURES

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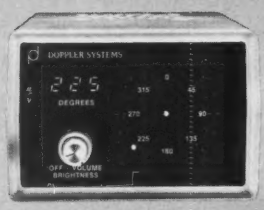

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In reviewing our dilemma at a subsequent critique, we concluded that we needed a highly portable remote base unit capable of accessing our repeater plus the ability to work with the hand-held units.

Previous approaches in *73* have dealt with cross-band remote bases by going inside the transceiver to find the COR point to provide control of the PTT of the remote base. Yet today's transceivers are so complex due to synthesizers, CPUs and memories that the average ham would not dare to open the cover. So here is a new approach. The following circuit offers an easy solution.

Circuit Description

Why not use VOX control instead of digging into the transceiver? This circuit centers around the LM3900 Norton op amp IC, which consists of four independent, dual input, internally compensated amplifiers which runs off a single power supply voltage. This op amp uses supply volt-ages from 4 VDC to 36 VDC with very low drawn current.

Looking at one section of the circuit drawing, you see where to pick off the audio speaker output from this transceiver, which goes through a small audio transformer (T1) to provide some impedance matching. This AC voltage (about 10 V rms) must be changed to DC voltage, so the 110 Ohm resistor (R3) and diode (D1) accomplish this task. Following D1 is a capacitor/resistor network that provides a timing function to delay the input (Pin 2) of the LM3900. This prevents words from entering the circuit and being chopped off at midpoint. This network also gives a short squelch tail on the output. At 'no activity', the voltage on Pin 2 is .15 VDC, and on Pin 3 it is .5 VDC. When Pin 2 detects activity, it goes high to .6 VDC and Pin 3 goes low to 0 VDC. The output (Pin 4) goes high to about 7.2 VDC.

> ***"Volunteers have a history of providing quality communications in time of need."***

The original prototype consisted of an NPN transistor driving a mini relay to accomplish the keying feature. The problem was excessive current drawn via the relay of approximately 80 mA on active. The appropriate circuit was in a packet TNC manual and used a MOSFET. The final choice was a heavier duty device than normally found in TNCs, however.

The 1RF511 Power MOSFET was found at the local radio supply house. This device was about half the price of the relay. The 1RF511 has very low on-state resistance combined with high transconductance, and the capability of sinking 3 amperes. When the gate of the MOSFET is driven high, the drain goes low. The only voltage on the drain pin is supplied by the relay voltage of the transceiver. The drain pin on the 1RF511 has a maximum voltage of 60 VDC. Parallel to the drain pin on the MOSFET is an over-voltage protection circuit consisting of a Zener diode (Z1) and a .01 disc capacitor (C3) to prevent voltage spikes from destroying the MOSFET.

The circuit that comprises R10, 2N2222 NPN, LED and R13 is an indicator to tell when the channel is active. The LED is mounted on the front panel. This portion of the unit is not mandatory, but does give good visual indication of the system in use.

The transmit/audio section is not elaborate. The capacitor (C7) and resistor (R16) were chosen to give the best audio response. The speaker/audio input to the Extender is tied to the microphone input of the other transceiver through this series capacitor/resist-

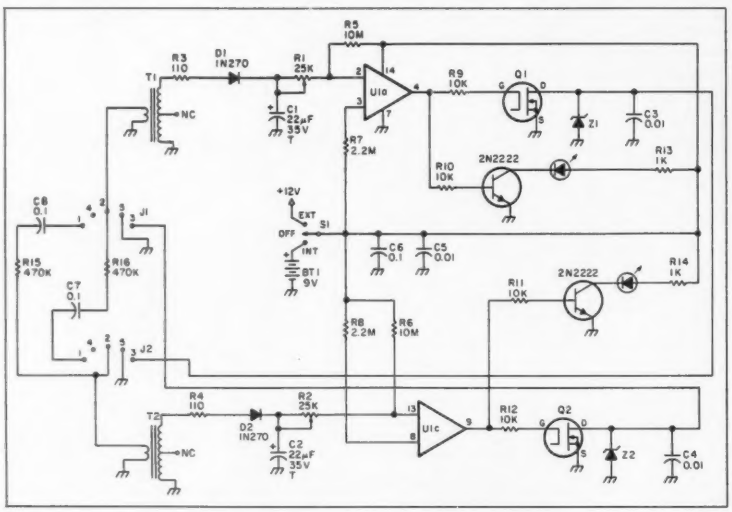

Fig. 1. Circuit diagram for mobile extender.

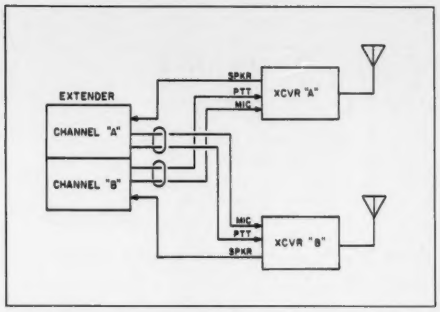

Fig. 2. Flow chart and wiring.

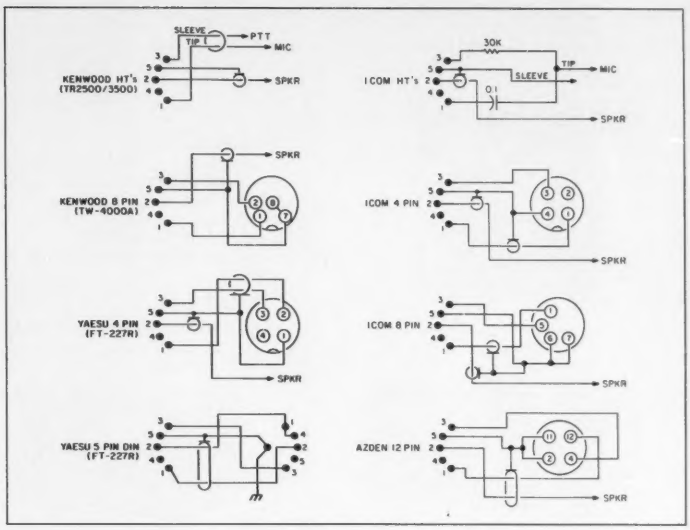

Fig. 3. 5-Pin DIN plug output to various radios.

or network. These values may change depending on your transceiver.

Tying It All Together

The wiring chart indicates that it is a very simple circuit to interface. XCVR "A" speaker output goes to channel "A" input. Channel "A" output (PTT/MIC) goes to XCVR "B" microphone jack (reverse for the other channel). XCVR "A" should be on your repeater channel (or can be on simplex). XCVR "B" can be on any unused Simplex Channel or on another VHF/UHF band. If XCVR "A" is on a 2-meter repeater channel, then XCVR "B" can be on either 220 or 440 mHz.

To make this circuit a repeater, set each XCVR on the frequency you want, and set the mode switch to Simplex. Disconnect the PTT/MIC cable from XCVR "A" and the Spkr plug on XCVR "B".

This version, using the power MOSFET for keying, dropped the current drain to 9 mA, active. This made it very practical to use an internal 9-volt battery supply. S1 is an On-Off-On switch for selecting either the internal or external power source.

To use this unit, plug in the appropriate cables to the transceivers. Adjust the volume controls to about half-way on each transceiver for inital tests. By selecting an active repeater frequency on XCVR "A", and listening on another receiver on XCVR "B", adjust the volume control on XCVR "A" so the audio quality is not distorted into the receiver listening to channel "B". Do the same on XCVR "B".

If you have installed the LED indicators, you will notice that when either of the receiver squelch drop out, the LED will remain on for a few seconds. This delay can be adjusted by turning the 25k pot (R1/R2) to a desired setting. This changing of the hang time will also affect the timing characteristics on Pin 2 of the LM3900. You may have to adjust both the volume control on the transceiver and the 25k pot to get the timing where you want it.

I made my unit with a small 4" x 4" premade circuit board, using point-to-point wiring. A custom-made circuit board could be produced reducing the size by half. A box measuring 4" x 6" x 2" was used to house the unit with the I/O jacks, power switch and external power jack on the rear panel.

When the extender is in operation you will first notice a silence upon release of the PTT on the unit you are operating. Approximately 2 seconds later, you will hear the distant repeater squelch tail, or beep tone. When you talk to the extender from your unit, it takes a short time for the extender to detect your voice and key the other unit which goes to the repeater. Remember, this is VOX. Any pause will let the extender drop out after a second or two. A good practice is to say, Aaaah, just as you key your unit, in order to activate the extender. This will take some practice when you operate through the extender.

PARTS LIST

Transformers		
T1, T2	8 Ohm: 1000 Ohm mini-audio xmfr	(RS273-1380)
Integrated Circuit		
U1	LM 3900 Norton OP Amp	(RS276-1713)
Transistors		
Q1, Q2	1RF511 Power MOSFET	(RS276-2072)
Q3, Q4	General Purpose NPN (2N2222, 2N3904, etc.)	
Diodes		
Z1, Z2	1N4752 1 watt Zener (33 v)	
D1, D2	1N270 or any diode	
Resistors		
R1, R2	25 kilohm mini-pot	
R3, R4	110 Ohm, ½ watt	
R5, R6	10 megohm, ¼ watt	
R7, R8	2.2 megaohm ¼ watt	
R9–R12	10 kilohm, ¼ watt	
R13, R14	1 kilohm, ¼ watt	
R15, R16	470 kilohm, ½ watt	
Capacitors		
C1, C2	22 mfd, 35 v Tant.	
C3–C5	.01 mfd, 50 v disc	
C6–C8	.1 mfd, 50 v disc	
Jacks		
J1, J2	5 pin DIN jacks	
Switch		
S1	on-off-on main-switch	
Battery		
BT1	9 volt alkaline battery	

Comments

This circuit has worked quite well. It has been used successfully with two handheld units, mobile units and base stations. The diagrams for various units depict the wiring for the cable assemblies.

The project can come to good use at parades, public events, and search and rescue work. Remember, you've just created a remote base or repeater, so you must say "remote base" or "repeater" with your call sign when you use the extender.

Note: Any comments on this project are welcomed, and a SASE will be appreciated. 73

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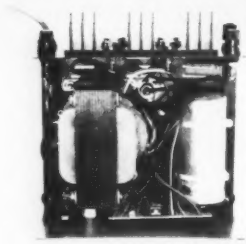

INSIDE VIEW — RS-12A

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- CROWBAR OVER VOLTAGE PROTECTION on all Models **except RS-3A, RS-4A, RS-5A.**
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- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM SERIES

MODEL RM-35M

19″ × 5¼ RACK MOUNT POWER SUPPLIES

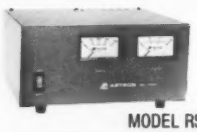
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4¾ × 5¾	4
RS-4A	3	4	3¾ × 6½ × 9	5
RS-5A	4	5	3½ × 6⅛ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7½ × 10¾	10
RS-10S	7.5	10	4 × 7½ × 10¾	12
RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

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Tech Talk from ICOM

ICOM

Handheld Transceivers: Enjoyment Unlimited!

Handheld VHF and UHF FM transceivers are extremely popular units among today's radio amateurs, and with good reason. The flexible capabilities of these small "go anywhere" portables are ideal for talking with local friends and coordinating group activities in an on-the-spot manner, and their benefits during emergencies are truly invaluable. The large number of range-extending VHF and UHF repeaters located throughout our lands also assure reliable communications using low power transceivers. Since the wide variety of presently available handheld transceivers seems to make selecting a particular unit somewhat perplexing, however, ICOM wishes to share field-acquired insight via this issue's Tech Talk.

The prime considerations in any handheld transceiver are smooth operation, top-quality construction and performance, and long-run customer support. Initially, consider a unit that's comfortable to carry and operate, then review its less obvious and internal attractions. Extensive use of VHF and UHF bands, for example, always encourage high intermod immunity. That is, the ability to copy a weak signal without undue noises or squelch "falsing" when you're physically near other signal sources such as radio pagers, mobile phone relays, etc. Likewise, sincere factory-backed service is the single most important factor separating one manufacturer's products from others. **ICOM handhelds are proud pacesetters in all of the previously discussed areas: a reflection of ICOM's dedication to keep you communicating through all the exciting times ahead.** Three styles of ICOM handhelds are now available to fit your needs.

The new and exciting ICOM MICRO (IC-μ2AT) handheld has acquired immediate popularity, as it combines all of today's most respected assets in an easy-to-operate and extremely versatile package. Liberal use of narrowband filters plus high gain/low noise circuits ensure **maximum weak signal sensitivity, selectivity and intermod immunity.** Those designs, like all models of ICOM handhelds, are complemented by fold-out pc boards mounted inside a **steel window frame-type subcase** for physical protection and electrical shielding. The complete unit is enclosed in a high-impact case.

As supplied with its attendant BP-22 slide on/off battery pack, the ICOM MICRO (IC-μ2AT) measures only 5.6 x 2.2 x 1.1 inches (H, W, D) and produces 1.6 watts output. Replacing that battery pack with ICOM's optional BP-21 reduces the transceiver's overall height to 4.6 inches while lowering RF output to 1.2 watts: the perfect shirt pocket or ladies' handbag companion. Alternately, substituting ICOM's optional BP-24 battery pack increases the IC-μ2AT's height to 6.6 inches while raising RF output to 2.6 watts for fringe/remote area use. Assuming the ICOM MICRO's (IC-μ2AT's) supplied 4-inch miniduck is then exchanged with a popular BNC-fitted gain antenna such as ICOM's optional $\frac{5}{8}$ wave whip, **the transceiver's effective radiated power increases above that of much larger five-watt units.** Mixing and matching accessories thus allows the ICOM MICRO (IC-μ2AT) to "change face" on a moment's notice: a truly versatile transceiver!

Operating the ICOM MICRO (IC-μ2AT) merely involves step-tuning any of its 10 memories to a desired frequency (even 162MHz NOAA weather!) using its top-mounted rocker switches. Each memory continuously retains its last selected frequency. The ICOM MICRO's (IC-μ2AT's) transmitter offset is selected by a rear panel "simplex/+/-duplex" switch. If "odd split" operation is desired, hold the display's nightlight button, switch the transceiver on, then step-tune the .600 (kHz) reading to any desired separation. The ICOM MICRO's (IC-μ2AT's) PL tone frequencies are standard and can be selected via a mini DIP switch inside its battery retaining plate. A 440MHz MICRO, the IC-μ4AT, is also available for 70cm enthusiasts.

ICOM's IC-02AT, IC-03AT, IC-04AT and IC-12AT transceivers continue their reign of supremacy as today's most deluxe and full-featured handhelds. These advanced technology units include direct keypad operation, memory storage of frequency, standard or odd repeater splits plus PL tones. Three scanning modes and priority channel operation "round out" these popular units. Their operation may be simple or sophisticated as personally desired and/or expanding with your future interests. A pocket guide is also included with these top-quality units for initial operating convenience.

ICOM also continues producing the ever-popular and easy-to-operate IC-2AT, IC-3AT, and IC-4AT units. These "basic style" handheld transceivers are perfect for budget-conscious amateurs desiring to expand their VHF/UHF horizons using top performers of time-proven design.

ICOM handhelds are also supported by a full line of matching accessories and, excluding MICRO unit battery packs, they are **interchangeable** between transceivers. **ICOM is your full line, full-time amateur radio equipment supplier of incomparable quality, performance and service!**

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KLM's field proven KT-34A is the heart of the "XA" model. The boom length of the "XA", however, has been doubled, and one tri-resonant and one full size 10 meter element have been added. These changes increase the gain to **11-11.3 dBd** on 10M, **9-9.5 dBd** on 15M, and **8.5-9 dBd** on 20M. Two driven elements are used to make the KT-34XA unusually broadbanded (a concept applied to many KLM antennas). Gain is virtually flat across each band except for 10 meters which has been optimized for the DX'er, 28-29 MHz. The chart shows the remarkable performance qualities of the KT-34XA.

The KT-34XA's design represents the first major advancement in tribander technology in over 20 years! The conventional traps, coils, and capacitors have been discarded in favor of integral linear loading and hi-Q air capacitors, all composed of aluminum tubing. These give the KT-34XA a conservative power handling capability of 4 KW PEP and an unusually high level of operating **efficiency**. Linear loading also makes full ¼-wave elements possible on 15 and 10 meters, and brings 20 meters much closer to the desirable ¼-wave than any conventional tribander.

BANDWIDTHS:	14.0-14.350 MHz	**GAIN:**	8.5-9dB
	21.0-21.50 MHz		9-9.5dB
	28-29 MHz		11-11.3dB
VSWR:	1.5:1	**BOOM LENGTH:**	32 ft. x 3" O.D.
FB/FS:	20dB/40dB	**TURN RADIUS:**	21.5 ft.
FEED IMP.:	50 ohms w/balun	**WINDLOAD:**	9 sq. ft.
BALUN:	3-60-4:1 5KW PEP	**WT. (LBS.):**	75 lbs.
ELEMENT LENGTH:	24 ft.	**MAST:**	2" O.D. (standard)

Mechanically, the KT-34XA has been built to survive the toughest weather conditions. All aluminum, including the boom, is strong 6063-T832 alloy. All electrical hardware is stainless steel. Virtually indestructible "Lexan" insulators, just like those on KLM's 40 meter "Big Sticker," are used for mounting the elements and insulating them from the boom. KLM's 3-60 MHz 4:1 balun is supplied for direct connection to any 50 ohm feedline.

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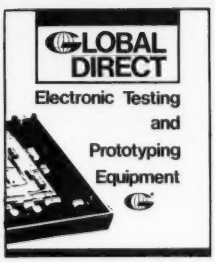

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FT-209RH RM Handheld 5w	359.95	Call $
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FT2700RH 2M/70CM 25w	599.95	Call $

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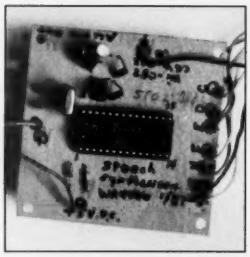

This little chip offers big benefits.

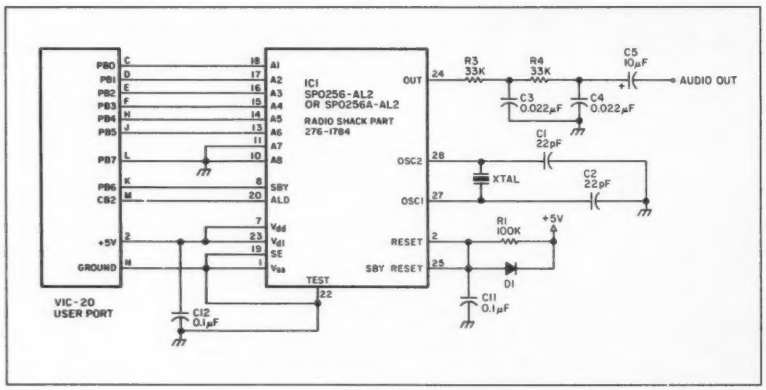

Fig. 1. Schematic diagram.

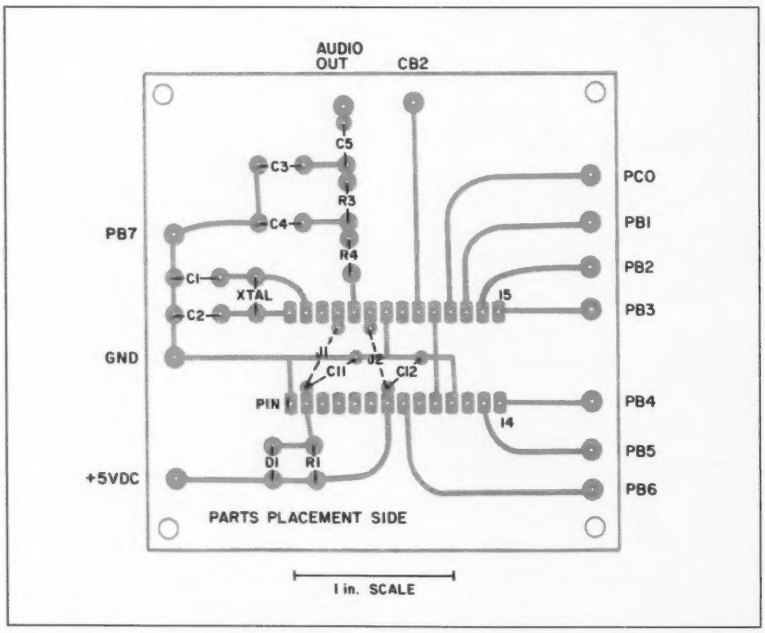

Fig. 2. Parts placement.

Do you want to teach your Vic-20 or Commodore 64 to talk? Here is a construction project that involves only one chip. It can be adapted to most PCs.

A talking computer offers many advantages: voiced I.D. for repeaters, talking clocks or thermometers, plus impressive games and teaching aids. All this and more is offered by a chip priced at $13 from Radio Shack.

Construction

The circuit can be put on a solderless breadboard. However, I have included my printed circuit pattern made from dry transfers. The parts are mounted on the non-foil side as usual, with the exception of jumper wires J1, J2 and capacitors C11, C12 which were soldered directly on the foil side (see Figure 2. Parts Placement).

The audio out requires outboard audio amplification. Fortunately, my computer monitor had an audio input. If this convenience is absent, almost any audio amp will do, including a very quick home brew using another Radio Shack chip, LM386, priced at $1. Instructions with the speech chip include audio amplification directions. Use shielded audio line to eliminate AC hum.

All other connections go directly to the user port on the back of your VIC-20. Ribbon cable would look good here; however, I used some surplus stranded hookup wire, courtesy of Ma Bell. CB2 on the user port of the VIC-20 is the one connection that differs on the C-64. In the case of the latter, use PC2 located at Pin 8. All other connections are the same for both computers.

Connection to the user port requires the 12/24 pin card edge socket. If you don't want to wait for your mail order, then get the 12/44 from Radio Shack and modify it with a hack saw. It helps to have a small two-inch bolt at both ends to get a grip on it with your fingers for mounting and removal from the back of the computer.

Frequency of the crystal will control the voice pitch. Instructions with the chip call for 3.12 MHz. However, a 3.579545 MHz TV

colorburst crystal from Radio Shack works fine, and it's cheap.

Using the Synthesizer

With a little basic programming it is easy to make the chip say any English word using an address table for data numbers as part of your program. The numbers must be in the form of decimal addresses. A booklet that comes with the chip offers a limited dictionary of words and details of how to make the chip speak them. It will also explain how to create more words. To help you get started, the sample program at right will teach your PC its first sentence. Notice that each line of data makes up a different word. You can change the data numbers to make new words and add more lines of data for longer sentences. Be sure to also change the "27" in line 65 to match the total of data numbers to be read.

For the C-64 you will need to change the following lines since its memory address locations controlling the user port are different from that of the Vic.

```
10 POKE 56579,63
40 POKE 56577,A
50 POKE 56577,0
60 PB=PEEK(56577)
```


References:

1. "Talk Is Cheap" by Thomas C. Johnson, WB6NQK, October, 1985, 73.
2. "Speech Synthesizer" by Ricardo Jiminez and Adrian Valle, August, 1986, Radio Electronics.

PARTS LIST

Resistors			
R1	100,000 Ohm		
R3, R4	33,000 Ohm		
Capacitors			
C1, C2	22pF ceramic		
C3, C4	.022uF ceramic		
C5	10uF, 10 volt, electrolytic		
C11, C12	.1uF ceramic		
Semiconductors			
IC1	SP0256-AL2 Speech processor	(Radio Shack 276-1784)	$12.95
D1	1N914 Switching Diode		
Other Components			
XTAL	3.12 MHz Crystal or 3.579545 MHz	(Radio Shack 272-1310)	$ 1.69
12.24 pin card edge socket (Jameco Electronics)			
or 12/44 pin modified to 12/24		(Radio Shack 276-1551)	$ 2.99
28 pin IC Socket		(Radio Shack 276-1997)	$ .89

SAMPLE VIC PROGRAM

```
10 POKE 37138,63
20 FOR J=1 to 27
30 READ A
40 POKE 37136,A
50 POKE 37136,0
60 PB=PEEK(37136)
70 F=PBAND64
80 IF F>64 THEN 60
90 NEXT J
100 DATA 24,6,0:REM I
110 DATA 7,7,16,2:REM AM
120 DATA 24,2:REM A
130 DATA 13,23,23,2,42,12,44,0:
    REM TALKIN
140 DATA 42,15,16,9,49,22,13,51,1,4:
    REM COMPUTER
160 RESTORE
170 FORT=1 TO 500:NEXTT:GOTO20
200 END
```

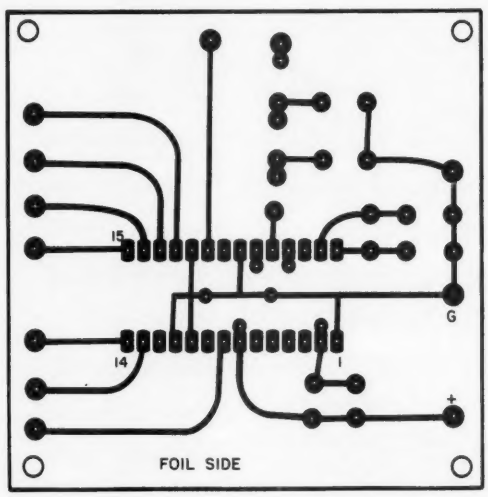

Fig. 3 Foil side.

AA	24	HOT		NN1	11	THIN	
AE	26	HAT		NN2	56	NO	
AR	59	ALARM		NG	44	ANCHOR	
AO	23	AUGHT		OY	5	BOY	
AW	32	OUT		OW	53	BEAU	
AX	15	SUCCEED		OR	58	STORE	
AY	6	SKY		PP	9	POW	
BB1	28	BUSINESS		RR1	14	RURAL	
BB2	63	BUSINESS		RR2	39	BRAIN	
CH	50	CHURCH		SH	37	SHIP	
DD1	21	COULD		SS	55	VEST	
DD2	33	DO		TH	29	THIN	
DH1	18	THEY		TT1	17	PART	
DH2	54	THEY		TT2	13	TO	
EH	7	END		UW1	22	TO	
EY	20	BEIGE		UW2	31	FOOD	
EL	62	SADDLE		UH	30	BOOK	
ER1	51	FIR		VV	35	VEST	
ER2	52	FIR		WH	48	WHIG	
FF	40	FOOD		WW	46	WOOL	
GG1	36	GOT		XR	47	REPAIR	
GG2	61	GUEST		YR	60	CLEAR	
GG3	34	WIG		YY1	49	YES	
HH1	27	HE		YY2	25	YES	
HH2	57	HOE		ZH	38	AZURE	
IH	12	SIT		ZZ	43	ZOO	
IY	19	SEE		10ms	0	Pause	PA1
JH	10	DODGE		30ms	1	Pause	PA2
KK1	42	CAN'T		50ms	2	Pause	PA3
KK2	41	SKY		100ms	3	Pause	PA4
KK3	8	COMB		200ms	4	Pause	PA5
LL	45	LAKE					
MM	16	MILK					

Table 1. Speech Processor Addresses.

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NiCd Charger/Power Supply

An easy two-in-one construction project.

Since I had accumulated a number of NiCd batteries and battery packs of various voltage and current ratings, I decided to construct a flexible piece of gear that would allow me to manipulate the battery charging cycles. The unit described here does the job nicely. It also serves as a variable power supply for the test bench.

The Circuit

To begin the project, I outlined the features and capabilities I required. I decided that 15 volts would suffice. I also needed no more than 500 mA of current for charging purposes. I found that the three-terminal, adjustable voltage regulators had a range of applications that would fit my needs.

These devices are available in several current ratings. The lowest is a 1-amp device which I would have used, except that it is in a TO-3 case. I wanted to use a TO-220 case, since it is easier to mount. I chose the National LM-317T 1.5-amp devices. The additional current capability is useful when using the unit as a power supply. I needed two regulators, one to regulate the voltage and the other to regulate the current.

Calculating the voltage required, and after factoring in the losses, I found that I would need a transformer with at least a 15-volt secondary. This would insure enough voltage for the regulator to operate properly when using the full 15-volt output. Radio Shack listed an 18-volt, 2-amp, center-tapped transformer with more capacity than needed, but the the price was right. I also found later that the LM-317T, with a good heat sink, would handle almost 2 amps.

With an 18-volt transformer, the available regulated voltage is approximately 20 V. Other users might elect to use a meter in the 20–25-Vdc range to take advantage of this additional voltage.

When I first constructed my unit, I had both regulators wired in series. This scheme worked fine as a current-limiting charger but required too much adjustment when the unit was used as a power supply. For this reason, I settled on the circuit shown here.

When used as a power supply, the current-limiting IC is switched out of the circuit. The current varies with demand up to the rated capacity. When used as a battery charger, this IC is placed in the circuit and output current is adjusted as needed.

The 2.2k resistor across the output establishes a nominal minimum load of 4 mA. Without this resistor the indicated voltage with no load is higher than the actual voltage applied to a load.

Parts List

C-1	Cap. Elect. 2200 uF 35 Vdc •
CR1	Rectifier, Bridge 6-amp, 50 PRV. •
D-1	Diode, LED 20 mA.
F-1	Fuse, ½-amp Pigtail type
M-1	Meter, 0–15 Vdc •
R-1	Resistor, 180-Ohm, ½-watt
R-2	Potentiometer, 2.5k (linear taper)
R-3	Potentiometer, 100-Ohm, 2-watt (10-turn preferred)
R-4	Shunt, Meter .056-Ohm (See text)
R-5	Shunt, Meter .57-Ohm (See text)
R-6	Resistor, 15k-Ohm, ½-watt
R-7	Resistor, 1.5k-Ohm, ½-watt
R-8	Resistor, 2.2k-Ohm, ½-watt
S-1	Switch, Toggle SPST •
S-2	Switch, Toggle DPDT •
S-3	Switch, Rotary 2-Pole, 3 or more positions
T-1	Transformer, 18 volt at 2 amps, Center-tapped •
	U-1, 2 IC. Adj. Voltage Regulator (LM-317T) •

Miscellaneous, Suitable Enclosure, Tie Strips, Binding Posts, Line Cord, Knobs, Insulators and Mounting Hardware for U-1 and U-2, Hook-up Wire.

Items marked with "•" are available at Radio Shack. Some items not marked may also be available there.

Construction

The construction is straightforward point-to-point wiring. Due to the few components involved, I found no reason to use a circuit board.

You can find most of the components in a well-stocked junk box or purchase them at a nearby Radio Shack. The only items that may cause difficulty are the 10-turn 100-Ohm pot for adjusting current and the rotary switch used for the meter switching. The rotary switch that Radio Shack sells is not suitable with too much contact resistance. The meter shunts will not track with this switch. I used a ceramic wafer switch similar to the type found in HF band switches.

I mounted the two regulators on the back panel of the enclosure, which acts as the heat sink. I mounted them with sockets for convenience. The bridge rectifier also mounts on the back panel.

I used two 8-point tie strips to make all the connections on the secondary side of the transformer. A 5-point strip on the primary side connects the transformer to the line. This strip also supports a ½-amp pigtail fuse.

My enclosure is a home-made aluminum box measuring 6″ x 3-1/2″ x 4″. This is about the right size to house the components with plenty of room on the front for the meter and controls.

The meter shunts shown on the schematic were made from standard value resistors. A .56-Ohm resistor allows a full-scale reading of 150 mA. Parallel .1-Ohm

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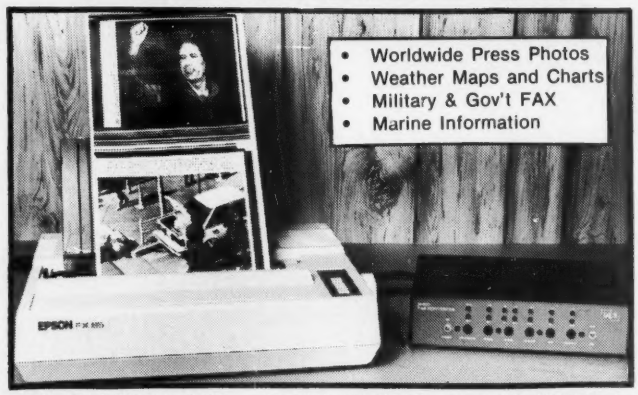

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1140 RG214/U dbl silver shld mil spec	*1.65*
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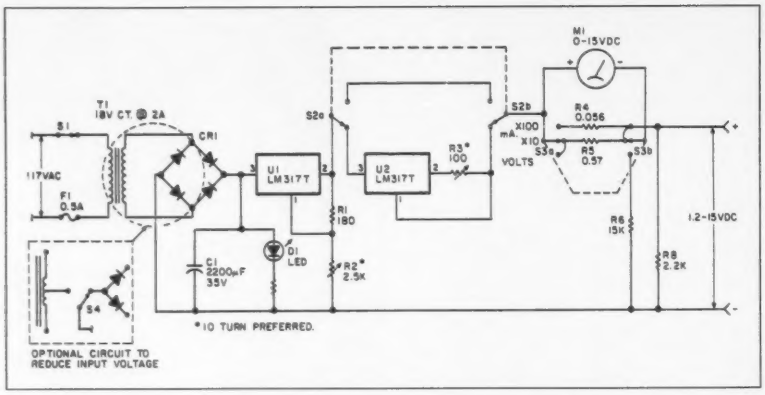

Fig. 1. Schematic for the NiCd battery charger and power supply.

and .13-Ohm resistors provide the .056-Ohm shunt for a 1.5-amp full-scale reading. There is no need for a 15-mA scale, since you cannot adjust the current below 12 mA.

This information applies to a meter with an internal resistance of 85 Ohms, such as the Radio Shack model specified. Meters of other manufacture or range may require the builder to recalculate the shunt values.

When calculating the shunts, you must consider the contact resistance of the meter switch. This is especially true of the shunt for the 1.5-amp full-scale setting.

Calibration

With the components listed, the meter will be within ± 5 percent. Trim the shunts and the multiplier resistor for greater accuracy. You can replace the multiplier resistor with a small variable resistor to calibrate the meter to an exact voltage near the point of greatest use. The shunts are a little harder to trim due to the small resistance required. They may be made with copper wire using a standard wire table to determine size and length. For example, 26.5 inches of #24 wire wrapped around a 100k 1-watt resistor will make the 1.5-amp (X 100 setting) shunt. The 150-mA (X 10 setting) shunt can be 66.25 inches of #30 wire on the same type of resistor. Adding an extra inch to the above lengths initially will allow you to match the shunt to the individual meter. It is also easier to shorten the wire than to lengthen it.

Operation

This unit allows great flexibility when used as a charger. You can select any charge rate up to capacity with the unit in the current-limiting mode. The unit will bring any battery up to full charge without fear of overcharging.

Most battery manufacturers recommend a charge rate to not exceed one-third the amp-hour rating of the battery. This would be considered a fast charge. The normal, or slow charge, is 10% of the amp-hour rating. These correspond to charge times of four and 15 hours, respectively. These figures are for the constant-current charging mode.

Although rarely mentioned in manufacturers' or vendors' literature, NiCd batteries can be charged to a specific voltage. This would be a constant voltage mode. This mode requires some limiting to control the initial current drawn by a discharged battery. The unit really excells in the constant voltage mode.

By setting a voltage limit approximately 10% higher than the nominal voltage of the battery and limiting the initial current to a safe level, the charging process becomes self-governing. A battery left on the charger indefinitely will not suffer any ill effects.

Options

The schematic shows an option that you may wish to incorporate. When the voltage requirement is low—10 volts or less—switching to full-wave center-tap grounded rectification reduces the current dissipated by the regulators, and improves their efficiency. When more than 10 volts are needed, switching to the bridge rectifier mode will supply adequate voltage for proper regulation. Obviously, this option requires a transformer that has a center-tapped secondary. A transformer with a dual-voltage primary, e.g. 110 and 220 volts, could also be adapted to this option.

Another option, although not included, would incorporate an external or internal timer to turn off the unit or reduce the charge to a holding rate. If the unit is to be turned off without disconnecting the battery, the circuit will require a blocking diode. This diode would prevent the battery from discharging through the meter circuit. 73

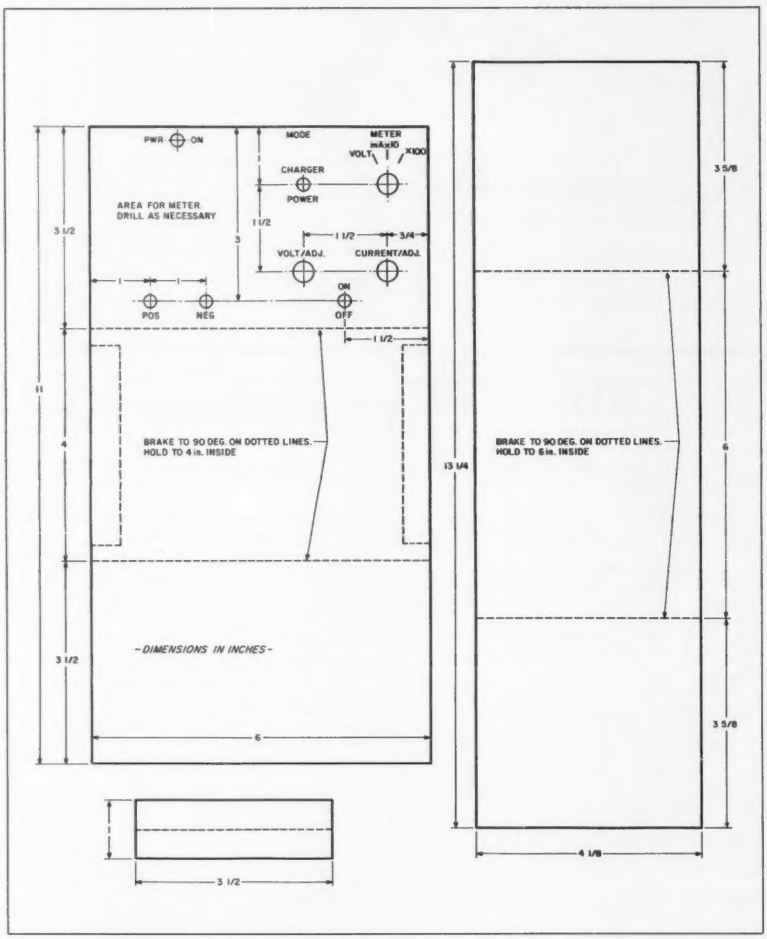

Fig. 2. The chassis template.

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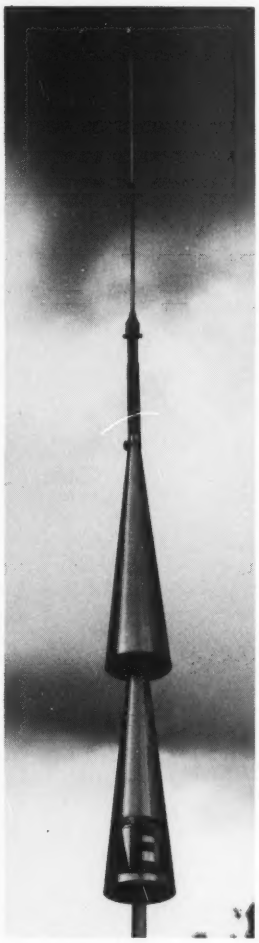

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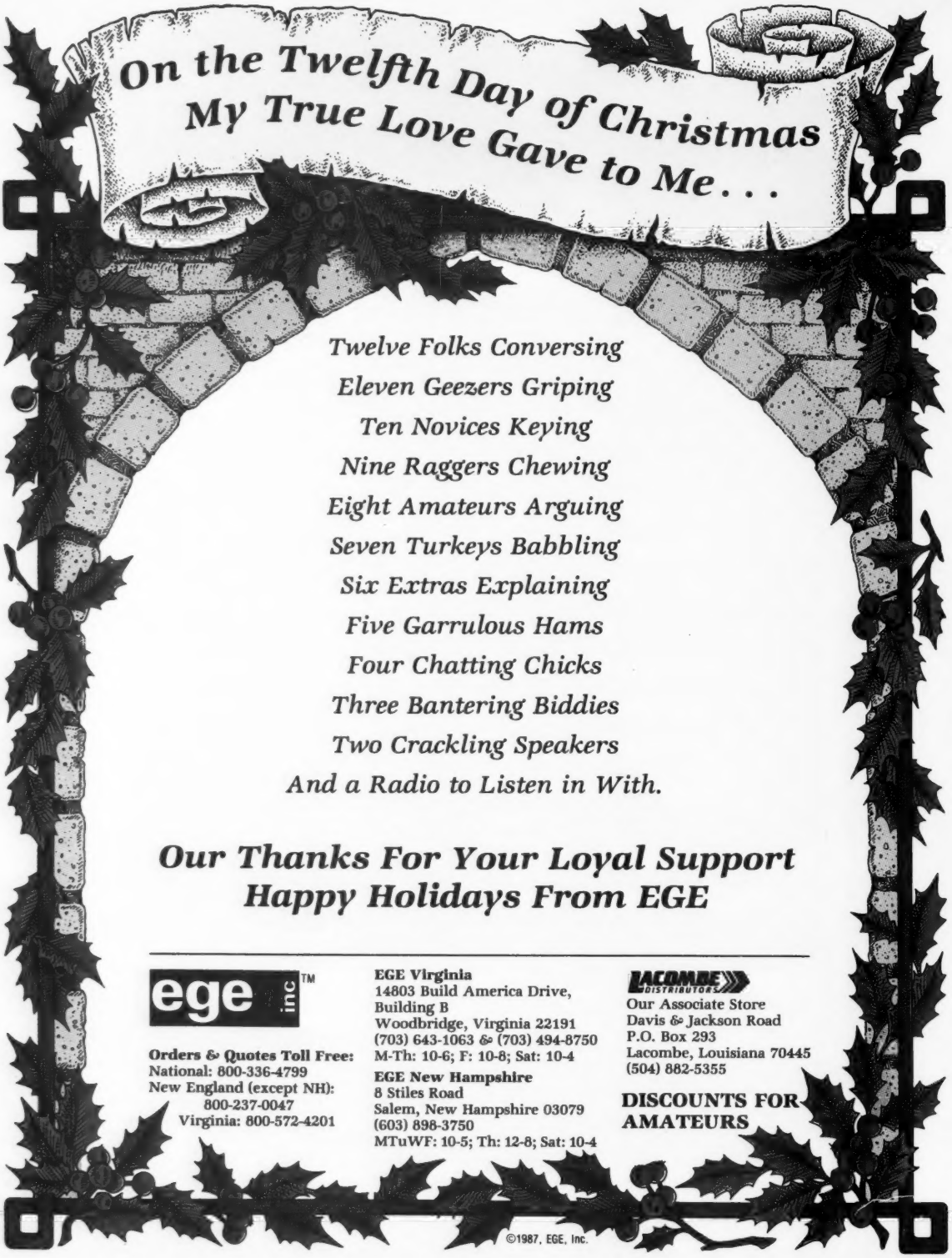
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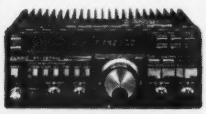

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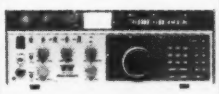

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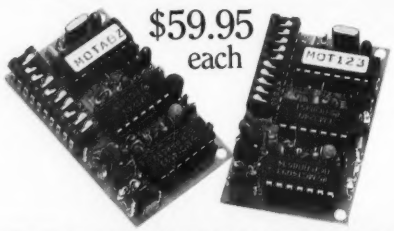

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A NEW FACE

Greetings fellow packeteers! I am deeply committed to the development and growth of packet radio. I hope this column will provide a forum for the discussion of the issues—technical, philosophical, and operational—surrounding packet radio and its future. But I need your help. I need the contribution of your ideas, designs, and projects. If you have used packet radio in a new and unique way, please share your experiences. Don't worry if your experiment seemed to be a failure. We often learn more from failures than from successes! To this end, please feel free to write to me in care of *73 Magazine* or to send electronic mail to me. My PBBS mail address is WB6RQN @WA3PXX. Let's work together for the growth and improvement of amateur packet radio.

The Technical Corner

Recently I received a bulletin from Norm W2JUP. Norm pointed out a basic but critical fact that many of us in the packet community sometimes lose sight of: proper functioning of packet radio requires good, reliable radio links. In order to have effective packet operation, your bits must arrive at the receiving station without errors. Every packet that arrives at its destination is a packet that does not need to be retransmitted.

This translates into better throughput and less channel loading. It seems like a simple and obvious subject, hardly worthy of in-depth discussion. But the fact remains that examination of several packet radio stations using test equipment has demonstrated very strongly that many of us have forgotten the basic lesson taught us by RTTY: there is no substitute for a good solid link and effective modulation/demodulation. You cannot simply take your TNC out of its box, hook it to the mike and speaker leads of your radio, and expect it to work. You are going to have to make sure that your TNC is properly adjusted for the particular radio to which it is connected.

Since the great majority of packet operations take place on the VHF/UHF bands using Bell 202 type modems and NBFM radios we perhaps need to review the basics of this type of operation.

In our standard TNC's the modulator part of the modem accepts digital data (1's and 0's) and uses it to switch between two tones, 1200 Hz and 2200 Hz. The audio spectrum required by this technique spans from about 500 Hz to about 2900 Hz. This conveniently fits within a standard voice-grade telephone line (300-3000 Hz), precisely what Bell intended when they designed the 202 modem. The demodulator discriminates between the two tones and recovers the original digital signal. Simple, huh?

When Bell developed its specification they took the characteristics of the phone line for granted. The phone company specifications say that the telephone line is flat from about 400 Hz to about 2900 Hz with minimal phase shift and at least a 30 db S/N ratio. Now let us examine our 2M FM radios and see how they stack up to the telephone line.

The "official" specification for an FM radio has a bandwidth similar to the standard telephone line. The major difference is that the transmitter is supposed to have 75 microsecond pre-emphasis while the receiver has 75 microsecond de-emphasis. This means that the transmitter should be flat to about 2100 Hz and then boost the high frequencies at a 6 db/octave rate above that. The receiver is supposed to perform the opposite operation, cutting high frequencies above 2100 Hz at a 6db/octave rate. The combined curves should be perfectly flat so that what we end up with is something that is very similar to the ideal phone line (with better signal-to-noise ratio to boot).

If all this were true then we would be seeing bit error rates (BER) of 1 x 10-5 (1 errored bit in 100,000) or better. For the average packet of 128 bytes this works out to about 1 packet in 85 being bad. Since we rarely see this kind of performance, even on a clear channel, there must be some sort of problem. There is. The radios really do not conform to the above specifications and the modem in your TNC tries but fails to correct for this.

The designers of NBFM amateur radios did not even begin to consider that your radio might be used to transmit data. They were concerned with how the radio performed on voice and that it met the FCC specifications for bandwidth and spurious emissions.

The ear is also almost totally insensitive to phase errors. On the other hand a modem is extremely sensitive to these errors. The clipper/limiter and low pass filter in the usual NBFM transmitter's audio stage introduce very large levels of these distortions that are essentially undetectable by ear but which make it almost impossible for the receiving modem to decode the data. That is why a signal that sounds good may not work with your TNC.

Another characteristic of voice radios is that they boost all the high frequencies on transmit and cut them on receive, even more than would occur with a simple 75 µs pre-emphasis/de-emphasis. This works because the energy in the human voice decreases with increasing frequency. Data transmission has a relatively even distribution of energy so such pre-emphasis is detrimental.

Since most of us must make do with voice radios we should set them up so as to give the modem the best possible chance to do its job. Here is a procedure that will extract the best possible performance from the modem in your TNC.

First, decide where to connect the output of the TNC to the transmitter. Many radios have an accessory or CTCSS (PL) input. This input usually enters the chain of audio processing after the limiter and the low-pass filter. If your radio has one of these inputs (sometimes on an accessory jack on the back of the radio but usually on an internal connector) this is where the TNC should be connected. If you connect your TNC here you do not need to worry about the damage to your signal caused by the limiter and the low-pass filter. Command your TNC to generate the high tone (use the calibrate command) and adjust the TNC output level and the deviation control in the radio for 2.5 to 3 KHz deviation.

If your accessory input injects the signal before the limiter/filter or you must put the signal in at the mike jack, you will need to use the following adjustment procedure:

1) Command the TNC to generate a tone (using the calibrate command). Increase the signal level coming from the TNC until the deviation of the radio no longer increases (the limiter is now limiting the signal). Reduce the level from the TNC until the deviation drops to about half of the

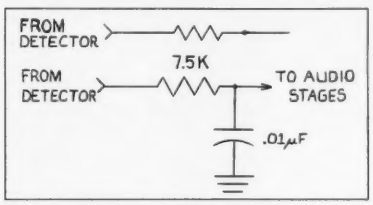

Fig. 1. 75-µs de-emphasis network.

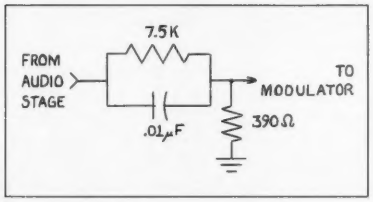

Fig. 2. 75-µs pre-emphasis.

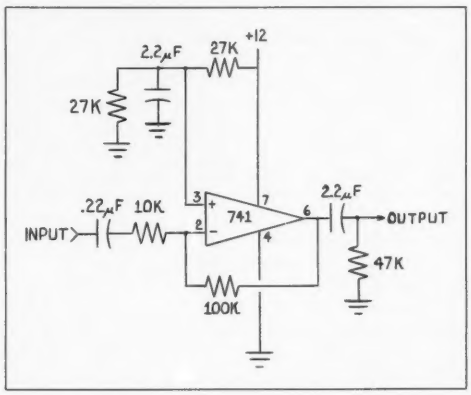

Fig. 3. Buffer amp.

maximum level you reached before (don't worry about the amount of deviation at this point). Now go into the radio and adjust the deviation control to give you 2.5 to 3 KHz deviation on the high tone.

As a final check of the transmitter check the deviation of both the high and low tone. The low tone (1200 Hz) should be between 0 db and 3 db less than the level of the high tone (2200 Hz). That means that if the high tone has 3 KHz deviation the low tone should have no more than 3 KHz deviation and no less than 2 KHz deviation.

Now to the Receiver

Hooking the speaker jack to the input of your TNC may be easy but it is probably not the best way to make the connection. Most radio manufacturers boost the low frequencies in the audio amp to correct for the deficiencies of the cheap little 2-inch speaker they put in. This is fine for your ear but is not what you want for your TNC. The original designers of the TAPR TNC-1 and TNC-2 decided to attack the problem by designing a complementary filter that boosted the high frequencies to counteract this distortion. This works just fine if the response of the input filter in the TNC really does complement the frequency response of the radio (can you say, "fat chance?"). If you have a TNC-1 or TNC-2 clone and want to find out, use a scope to look at the output (pin 1) of the MF-10 filter chip. The two tones should be within ± 2 db of each other.

If this concept of distorting the signal first one way and then distorting it back the other way to fix it seems a bit excessive to you (as it does me) you might want to try a different approach. There is a source of perfectly good undistorted signal waiting to be tapped at the discriminator. Some radios have a center channel meter that reads the discriminator offset—a good place to look for the signal. The hot side of the volume control is usually another good place to tap into this signal.

If you are using a TNC-1 or TNC-2 clone and you wish to use this direct connection you will need to remove the MF-10 filter chip and its associated resistor pack (U17 and U18 in the TNC-2). If you have a TNC-2 clone you now jumper pin 1 to pin 8 on U17 and you are done. You may now connect the discriminator directly to the TNC through the appropriate de-emphasis network (the high and low tones should be within ±2 db at the input to the demodulator in the TNC).

Should you decide to use the discriminator signal be sure that you do not load down the signal too much. The Exar 2211 demodulator used in the TNC-1 and TNC-2 clones will not load the discriminator too much and may be connected directly. If your TNC has a low impedance input network (Kantronics' TNC's come to mind here) you may need a buffer between the discriminator and the modem. Figure 3 shows a good buffer circuit for the discriminator that will happily drive just about any TNC. Build it if you are concerned.

What's the Cost?

You sit down at your terminal, turn on your radio and TNC, and check into the local bulletin board. You receive some mail from a friend across the country and you read it. You compose a reply, send it off, and log off the BBS. Not too bad considering all you had to buy was an inexpensive TNC, huh! Have you ever considered what it cost to get that message to you?

Somewhere out there many people have paid a great deal of money to construct digipeaters, BBS's, and HF gateways in order to deliver your mail to you. If you consider that your local BBS probably consists of a PClone (that's PC+clone), one or two TNC's, and one or two radios, the price was probably between $1200 and $2000 for that BBS that you are using. Have you offered to help out financially to maintain this resource? You say you can't afford to kick in very much money? How about forming a packet radio club to pool your resources!

The result would be a packet community no longer dependent upon the goodwill of a few generous packeteers. It would also provide an advantage for the future when the packet switches that will make up our networks will, more than likely, cost thousands of dollars (much like the good repeaters do today) and thus be beyond the individual means of all but a few of our wealthier brethren. Why not get your packet club together today and start looking toward the future?

And, by the way, when your local BBS goes off the air because its owner needs the computer for something else or he moves away, don't say I didn't warn you.

New Goodies

One of the things that has been holding up packet network development has been the lack of easily available high speed modems (9,600 bps and faster) and the lack of packet switch hardware to take advantage of the fast modems when they arrive. At last both gaps have been filled.

Dale Hetherington, WA4DSY, has designed an elegant 56,000 bps modem. The modem accepts digital data at 56,000 bps in one side and generates RF at 29 MHz on the other. Likewise it accepts RF at 29 MHz and converts it into digital data at 56,000 bps. Why 29 MHz? Because you can readily acquire transverters to put your signal on the desired band. The modems have been tested extensively in Atlanta, Georgia, and work very well!

If you are interested in constructing one (or two) for yourself contact Doug Drye, KD4NC, at P.O. Box 871, Alpharetta, GA, 30239-0871. The three-board set (not a kit—boards and documentation only) costs $75 (please add $5 for shipping). If you can build a TNC-2 you can build one of these modems. You may have to scrounge a bit for the parts, but isn't that part of the satisfaction! The modem uses all commonly available components. Acquiring them should require little more than a visit to your local hamfest and Radio Shack.

But now we need something (besides the KISS TNC—more in a later column) to generate data at 56,000 bps to drive our fast modems.

A group of hams in San Diego have solved that problem. Mike Brock, WB6HHV, Franklin Antonio, N6NKF, and Tom LaFleur, KA6IQA, have constructed a packet switch board called the PS-186. It is powered by an Intel 80186 processor and has up to 256 Kb of ROM and up to 1 Mb of RAM. There are 4 HDLC (read "packet") ports that will each run up to 1 Mbps. That's right! One million bits per second (makes 1200 bps packet seem rather slow, doesn't it). If you populate it with all CMOS parts it requires only 2W of power. Many other design features make it just the thing for mountain tops.

If you are interested in getting one of these boards or just interested in information, send mail to Tom LaFleur at PO Box 9045, La Jolla, CA 92038.

Mark my words. These two pieces of hardware are going to revolutionize the networking aspects of amateur packet radio.

Well that's it for this month. Next month we will spend more time on radios, modems, and what is new on the software horizon. See you then. 73

Measuring Deviation

Setting FM transmitter deviation is a critical item in amateur packet radio, yet most packet enthusiasts ignore the problem. Obviously the easiest way to measure deviation is with a deviation meter. If you are lucky enough to own one, use it. On the other hand a deviation meter is nothing more than a meter attached to the discriminator of an FM receiver. An oscilloscope or meter attached to the discriminator before any de-emphasis network will work well. If you use a meter you will need to provide some sort of buffer amplifier and peak hold circuit between the discriminator and the meter. Such a circuit is described in the *ARRL Radio Amateur's Handbook* in the section on FM.

The big problem is calibrating the meter. If you have a known reference you are in luck. Just adjust your meter to match the reference meter. If you don't have a reference you can use a linear receiver (SSB or CW) to monitor the carrier from the FM transmitter and use the Bessel function characteristics to determine the deviation.

Set up an FM transmitter with a calibrated audio generator as its input. Set the frequency of the audio generator to 2079.2 Hz and its output level to 0. Key the transmitter and tune in the FM carrier with the linear receiver set at its narrowest bandwidth (use a CW filter if you have it). Slowly increase the output from the audio generator and notice that the carrier begins to decrease. At the point where the carrier reaches its lowest level the deviation will be precisely 5 KHz (a further increase in the level of the audio generator will cause the carrier to increase again). Now use this FM signal as a reference for your deviation meter. See the Radio Amateur's Handbook for more details on this method.

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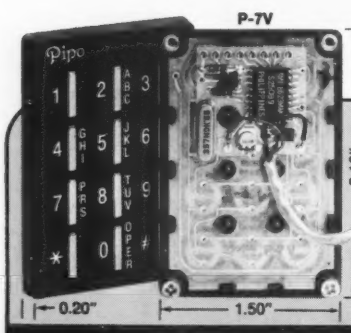

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CIRCLE 129 ON READER SERVICE CARD

CIRCUITS

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Great Ideas From Our Readers

Many readers will recognize the revival of this regular feature, which has been absent from the pages of 73 for several years. We welcome brief contributions of circuits. If your idea is published, you will receive a free subscription or a renewal. Clearly indicate that your submission is for this column and not a manuscript for an article.—Ed.

CHEBYSHEV FOR SIX: *When I recently got back on six meters SSB with a Swan 250, I discovered a number of images, spurs, and other unwanted signals. One of these is handy. It has a stable signal locally on about 50.113 MHz, which can be used like a beacon to judge band conditions from day to day. However, a strong FM station on 89.7 MHz also splatters into the Swan, beating with the second harmonic of the injection frequency. There are two ways to deal with the problem: attenuate the incoming signal or attenuate the oscillator harmonic. The preferred way is to put a filter between the rig and the antenna, because that also attenuates radiation from the transmitter that might cause TVI. What kind of filter?*

A Chebyshev is easy to design, and it can be adjusted without elaborate instruments. Suck-out traps were added to degrade the unwanted incoming signal.

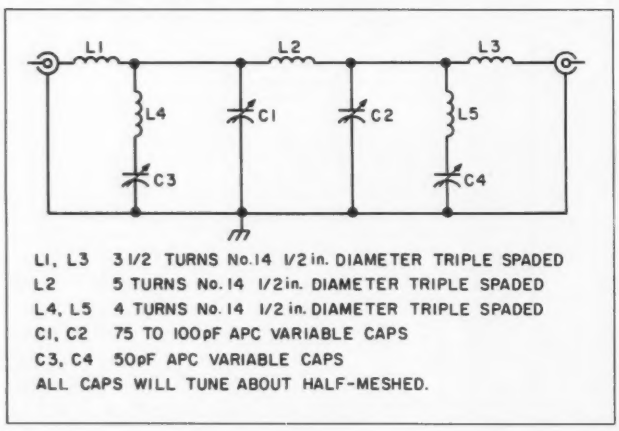
L1
L2
L3
L4
C1
C2
L5
C3
C4
L1, L3 3 1/2 TURNS No.14 1/2 in. DIAMETER TRIPLE SPADED
L2 5 TURNS No. 14 1/2 in. DIAMETER TRIPLE SPADED
L4, L5 4 TURNS No. 14 1/2 in. DIAMETER TRIPLE SPADED
C1, C2 75 TO 100pF APC VARIABLE CAPS
C3, C4 50pF APC VARIABLE CAPS
ALL CAPS WILL TUNE ABOUT HALF-MESHED.

Fig. 1.

I will skip the math, because if you can do that yourself you don't need this article. The coils are oriented 90 degrees apart to reduce mutual inductance. Beyond that, construction is what you find convenient. Keep short leads to the coils, because leads add inductance at these frequencies. I used the familiar APC capacitors (first used in the plug-in coils of the 1930s Hammarlund receivers) but any will do. For good shielding, I built it on the tight-fitting lid of a can that once held Christmas candy. (Tea canisters are also good.) Tune-up requires only a grid dipper or tunnel dipper.

Tune the middle coil (L2) to 55 MHz, using the same capacity setting on each side. Temporarily connect the two trap circuits (C3 L4, C4 L5) as parallel circuits and rough-tune to the frequency you want to reject. (They can be two different frequencies, if desired.) Then connect the trap circuits as series-resonant circuits and solder to the rest of the filter as shown in Figure 1. Insert the device in the line and find the unwanted image. Adjust the trap nearest the antenna to reject it. The other trap can be tuned to the same frequency or a slightly different one if there is another station you need to chop out. Enjoy—

Wm. Bruce Cameron WA4UZM,
Temple Terrace, FL.

Parts List for Oscillator

R1	100k, ½ watt
R2	33k, ½ watt
R3	68k, ½ watt
R4	40-Ohm pot (I pulled mine from an old TV convergence board—value of R4 not critical)
IC	NE555
D1–D5	any signal diode (silicon)
Q1	2N2222 or any NPN small signal transistor
C1	.01 ceramic,
C2	4.7 uF, 16V
B+	9-volt battery
	Any loudspeaker

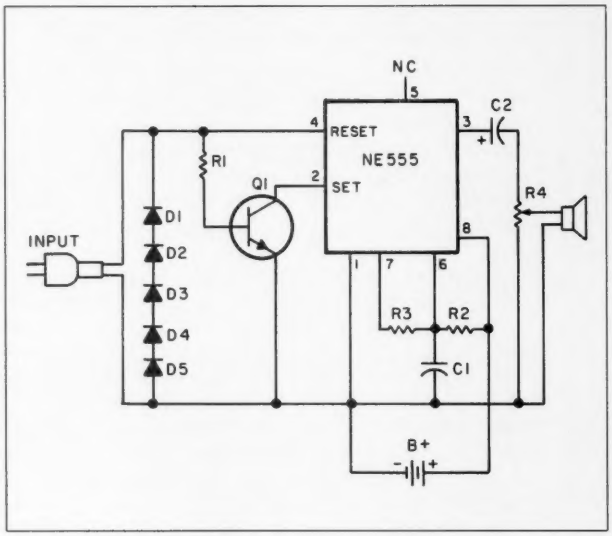

Fig. 2. This circuit will follow any frequency of audio tone.

CLEAR COPY OSCILLATOR CIRCUIT: *I have a Commodore 64 computer I wanted to use in teaching Morse code. But the audio chip in the 64 has a pop when it comes on or goes off a tone. This makes code harder to copy and almost impossible to record for practice or giving tests. I tried many combinations of settings to alter attack, sustain, and decay, but found no settings to eliminate this problem. I decided to make an audio processor to clean up this troublesome noise.*

The circuit design is as follows. The heart of this audio processor is a 555 timer IC. By feeding the audio tone to the trigger input and the reset input, the 555 can be used as a flip-flop with a huskey buffer and can drive a speaker with enough volume to cover a large auditorium, or can be reduced using either a wire-wound pot or a smaller output capacitor.

The audio input can use either an RCA jack, to use with a monitor cord, or about a three-foot cord with a DIN plug when using a TV set as a monitor. Pin 2 is the high side and Pin 3 is common or ground. The input is shunted with 5 small signal diodes that clip the audio signal to a usable level. I put the anode side of the diode string to common or circuit ground. To get the IC to toggle, it is necessary to invert one input. I used an NPN transistor to invert the signal on Pin 2of the IC. There is a 100k resistor from the audio source to the base, the emitter is grounded, and the collector goes directly to Pin 2, the set input. Audio input goes directly to Pin 4, the reset input.

If you wish to record the output, just hook a 100k resistor to the output side of C2 to a shielded lead to the mike input on your recorder.

—Leonard Bauman, Sr. K9RMN,
Rhinelander, WI.

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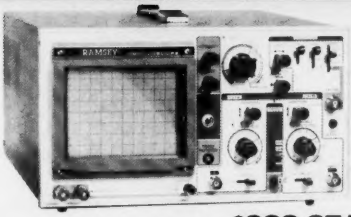

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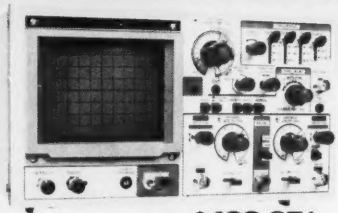

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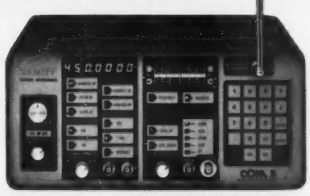

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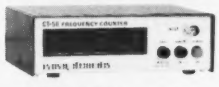

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SATELLITE IMAGES

Last month I promised some discussion of video processing. Video processing is quite a fascinating and complex subject that will take more than a month to cover, so we had better get started!

Any weather satellite image consists of a range of brightness values represented by a range of subcarrier amplitudes between 4% (black) and 100% (white). No matter what kind of display we use—an analog CRT monitor, a FAX recorder, or a scan converter—we first want to reproduce this range as accurately as possible to display the original image. In practice we rarely achieve a 1:1 correspondence between the original image brightness values and those of our displayed image or print. Without knowing it, we all engage in some degree of image processing. We do so whenever we adjust the brightness and/or contrast of our display system. In most cases we are simply trying to make the picture "look good"—increasing video contrast to bring out more detail in a dark area of an image, reducing contrast to reveal more structure in bright clouds, compensating for display response at the black or white ends of the grayscale, etc.

Assuming a good distribution of brightness values in the original image, such "low-level" video processing is usually adequate for a satisfactory display. WEFAX images, which are already processed by ground computers, fall into the category of "easy-to-display" images with excellent results with simple adjustments of contrast and/or brightness controls. Once you have your display system set up, you can print or display endless WEFAX images and get excellent results. This pleasant situation falls apart, however, when you start to play with polar orbit satellite data! Let's look at an excellent example of the kind of problems we have to face.

A Problem to Consider

Figure 1A shows a hypothetical oscilloscope display of the video detector/filter output with an image from a typical winter daylight pass from one of the TIROS/NOAA polar orbiting spacecraft. For the sake of illustration, let us assume that the detector will deliver a signal ranging from 0V for black to +5V for white, and that the rest of our display system is set up to deliver a good contrast image when driven by signals in this range. Unfortunately, this sample of image data will give us some problems since the first half of the APT line (the visible light data) will reproduce very dark. All the video data are in the low end of the dynamic range, while the IR channel (the second half of the APT line) will probably look pure white.

When you first look at data like this you might wonder why we can't build a satellite that will produce decent pictures! Look at the problems faced by the folks who design these spacecraft. Both the visible and IR sensors in the spacecraft imaging system have a very wide dynamic range. In terms of visible light, the sensors have to be able to provide usable data under brightness conditions ranging from the murk of polar regions in the middle of winter to the brightest cloud illumination at equatorial latitudes. The IR sensors have to provide a usable response over a temperature range that encompasses the Sahara at noon to the polar ice caps in midwinter. They really do accomplish this, as the visible and IR mosaics transmitted by WEFAX demonstrate, but that doesn't help us with *our* display problems! In the case of our NOAA image, all the usable visible light data is crammed at the black end of the grayscale while the IR data are all clustered at the white end of the dynamic range. Since any display system has a finite dynamic range, the result in this case is an overly-dark visible light segment and an overly-bright IR channel with neither providing sufficient detail to be labeled anything close to satisfactory.

An Easy Solution

In the case of the visible light data, we could simply increase the system contrast until we got a satisfactory display—a situation illustrated in Figure 1B. Increasing the contrast has expanded the range of variation in the visible channel to produce a nice display. Although this is an *easy fix*, it is not without its problems. First, without a scope, you would probably have to print or display the image several times until you got it just right. You will also have to readjust the contrast again to display METEOR or WEFAX data.

Finally, the IR data was already quite close to the upper end of the system dynamic range (Figure 1A), and our contrast increase simply raised the system gain enough to clip out all IR variation at the +5V white limit (Figure 1B)! For openers, you might think that a contrast reduction contrast improves the IR display by sliding some of the incoming data down toward the black end of the dynamic range. The results will depend very much on where you live and the season of the year. At low latitudes or at mid-latitudes during the summer you may get a usable display, but mid- and high-latitude stations will not get much in the winter months. There is simply too little subcarrier variation to yield more than a few tantalizing patterns. Figure 1C shows a possible result. The IR data are now well within the 0–5-V range, but "blackest" and "whitest" signal levels differ by very little, so our low-contrast image will be a dingy gray!

Given these problems, we can see why most polar orbit stations use the visible light data, despite the fact that IR data are available during evening passes when most of us are at home!

To avoid constant fiddling with display settings, we must resort to full-blown video processing. In the case we have discussed so far, we want simple *contrast enhancement*. For the visible light data we would like to take the relatively small range of variation near the black end of the dynamic range and expand that to yield a full black to white range on our display. Granted, we can do that with display contrast manipulation, but ideally, we want to simply adjust the display for the best possible display of subcarrier data in the 4% to 100% range and leave it there. Similarly, we want to take the small range of variation at the white end of the IR data range and expand that to increase contrast. Prior to looking in detail at how to accomplish these operations, let's examine some very general requirements and approaches to image processing in general and contrast enhancement in particular.

Analog versus Digital

Most analog display systems, such as CRT monitors and FAX recorders, have no capacity to store image data. They simply accept subcarrier data at the input and transfer it to the CRT trace or FAX paper. Such a system requires "on the fly" adjustments. Real-time processing can be extremely effective, but if the results are unsatisfactory we must print the image again. Without an oscilloscope to aid in level adjustments, replaying and readjusting display recordings can consume a lot of time.

Digital scan converters store the image data in numerical form in a solid-state memory. In such a case, we have the potential to process the image data *after* storage without having to reload the image with each attempt. Not all scan

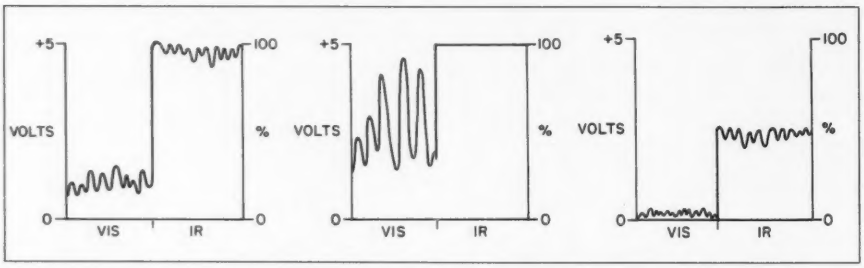

Figure 1. 1A is normal signal output. VIS image is dark and low-contrast. IR image is white and low-contrast. 1B shows increased contrast. VIS has good contrast, but the IR image is clipped white! 1C shows decreased contrast—no VIS image, IR image is gray, and contrast is low.

converters actually have such capability, however. Some scan converters employ dedicated or "hard-wired" designs that do not incorporate internal image processing capabilities. Dedicated scan converters of this type (such as the Wrasse 665) do not allow manipulation of the memory's contents or of changing the numerical value of pixels in their passage from memory to display. So we change the video values at the input. Even some computer-driven scan converters have this problem. The ones in question are those that use minimal bit coding for the data in memory. This will take a bit of explaining, so let's get to it.

Most experimenters will agree that it takes a minimum of 16 grayscale steps (4-bit video) to provide an acceptable TV display. Fewer steps results in a very "digital"-looking image with unacceptable contouring, or a "paint-by-numbers" appearance. Any scan converter that stores pixel data in a 4-bit format (range of 0–15) will have a problem with image enhancement, and this includes the *Weather Satellite Handbook* (*WSH*) and Clay Abrams designs when used with a 64K computer. Both designs store pixels in the same 4-bit format used for display. Let's look at the problems that might occur if we had a picture in which all of the video variation is in the upper 50% of the dynamic range. All of our image data would be in the range of 8–15, resulting in a very washed-out image. As we shall see later, it is no problem to rescale these pixel values so that the original brightness distribution of 8–15 was shifted to a range of 0–15, and we would gain plenty of contrast in the bargain. The problem is that we only had 8 useful steps (8–15) to start. Our new pixel distribution would still have only 8 steps (values of 0, 2, 4, 6, 8, 10, 12, and 14 or 15, depending on how we did the transformation) so that our new image, while possessing full contrast, would be highly contoured and would look pretty bad. The problem gets even worse with greater expansion. With winter IR data, all the 4-bit variation might be in steps 14 and 15. No matter how we "stretched" the contrast, we only have two useful steps available, and the more we stretch the range, the worse the picture will look!

The Solution

The solution is to have more video bits available than we actually need for display. Let's say that the same image data are stored in 6-bit form (64 grayscale steps), but that we are using 4 bits (16 steps) for display. In the case of our first example, with video variation in the upper 50% of the dynamic range, the usable data would all be in the range of 32–63—a total of 32 steps of image data. Since this far exceeds the 16 steps actually used for display, we can stretch or otherwise manipulate the *display* dynamic range without any increase in contouring. In fact, we could expand anything down to 25% of the dynamic range and still retain the normal display! Assuming 4 bits minimum for display, at least 6 bits are required for pixel storage in memory to have any real processing options available without degrading the quality of the displayed image. If your display uses 6 bits, then you should use 8-bit storage (1 byte/pixel) to achieve similar flexibility.

So what do you do if the memory isn't available to allot 6 bits per pixel? One answer is to perform a 6-bit A/D conversion of the video and then convert it to the desired 4-bit format prior to memory storage. That works just fine, but it is an "on the fly" technique with its associated problems. Also, the clock speed on a standard CoCo 1 or 2, for example, will barely permit a 6-bit software A/D conversion and allows precious little time for complex 6- to 4-bit conversion algorithms. One solution would use a fast hardware A/D to leave enough time left for processing. The new CoCo 3, however, will do a 6-bit conversion in half the time as the earlier models with its faster clock. The decreased conversions time also allows plenty of time to manipulate the 6-bit pixel data.

Breaking the 64K memory barrier provides you with lots of new options and flexibility. Use of the 512K CoCo 3 with the Version 4 software for the WSH scan converter allows the storage of 768 lines of image data with 1024 4-bit pixels/line, providing the flexibility for the ultimate in high resolution display via "zoom" routines. The latest software development (Ver. 4.5) incorporates a host of "on the fly" processing routines, which permit image processing while retaining full resolution. Since storage of a 1024 x 768 4-bit image requires 380K of the 512K of available RAM, there is not room for 6-bit pixel storage needed for enhancement routines operating straight from memory. I did write a program that incorporated "from memory" enhancement with the image stored at 512 x 512. While the enhancement flexibility was nice, I did miss the extra resolution. Since I rarely find the need to enhance WEFAX or METEOR imagery, and the enhancements for NOAA are seasonal and generally predictable, "on the fly" conversions lose very little in light of the advantages of full resolution.

In summary, "on the fly" processing *must* be used with analog display systems and some scan converters. Similar approaches may be useful with other scan converters where memory is limited in terms of the desired level of resolution. "From memory" processing requires ample RAM for video storage. If you want both high resolution *and* the capability to process from memory you will need a lot of *video* RAM. Memory management requirements, which stem from execution of display options, further complicate the situation. The 1025 x 768 storage for the Version 4.X software for the *WSH* scan converter was chosen on the basis of memory management/display option criteria. Storage of 4-bit pixels in this format requires 380K of video RAM. Optimum bit packing for 6-bit pixels at that resolution requires 576K of RAM and lots of software overhead for formatting pixel data. Storing one 6-bit pixel per byte simplifies the software, but that increases RAM requirement to 768K. This translates to elaborate extended memory options for a PC or a class jump to super Macs or AT+ class computers.

How To Do It

In effect, video processing involves purposely distorting image brightness relationships in to get the specific display we need or want. There are many ways to accomplish this, but to keep the discussion manageable I will focus on three basic approaches—analog processing, something I will call "transparent digital processing," and strictly digital techniques. These will take a bit of space to discuss, however, so I defer them until next month.

Picture of the month: The above beauty is a submission from Don Shelley (KD7BU) from Glendale, Arizona. This represents a NOAA 5-pass (visible light data) taken back in May of 1977 using 35mm film and a CRT monitor. The image is superb and shows off that arid western countryside to good advantage. The California coast and Baja California show up beautifully and there is some nice sun-glint off the Pacific south of Baja.

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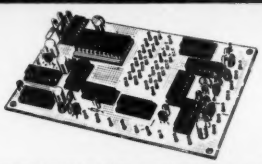

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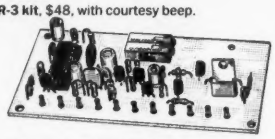

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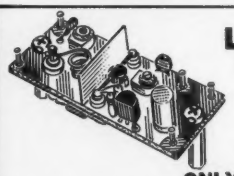

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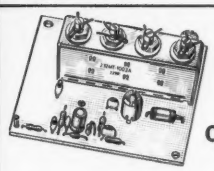

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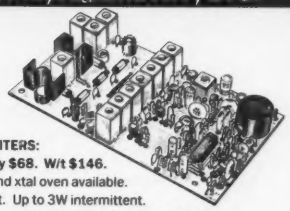

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AERIAL VIEW

Antenna News

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SOME THOUGHTS ON MOBILE ANTENNAS

Recently, while loading the car for a vacation trip, my wife commented that my mistress is coming with us. My "mistress" is my radio gear, and in this case "she" was the TS-130 I use when operating HF mobile. My affair with HF mobile, however, involves something of a love-hate relationship—I love to keep schedules with friends on 75 meters as we motor along, but I hate the frustration of trying to maintain those contacts in the face of QRN and QSB. I don't often have difficulties on the receiving end, but it can be tough to make yourself heard when mobile, especially on the 80/75- and 40-m bands. So why do I (and other HF mobilers) sometimes have difficulty making contacts when the same transceiver at home produces solid contacts? The answer lies in the antenna system.

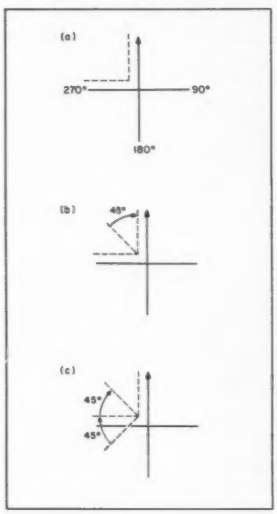

Fig. 1. Orientation of radials added to mobile at rest to maximize received signal strength. All radials were 33 feet long, bare copper, laid on the earth's surface. The near ends were attached to the body of the vehicle to achieve good electrical contact. In all cases, the vehicle faces in the direction of the arrow, with the signal arriving from the left (270°). (a) Two-wire case. Signal strength improvement is 1–2 dB. (b) Three-wire case, with improvement of about 2 dB. (c) Four-wire case, with 3-dB improvement. Numerous combinations were tried. As more wires were added, their orientation became less critical. Depending on antenna placement on the vehicle, other radial patterns may prove more effective for other installations.

The typical home station antenna for the lower HF bands is an inverted vee or horizontal dipole constructed of wire. The efficiency of such an antenna is typically 98% or better; i.e. 100 watts in, 98-plus watts radiated. A typical 75-m mobile employes a whip 8 to 9 feet long and a coil for loading it to resonance. Make a guess about its efficiency. 50%? 30%? 10%? Try 3–5%. That means for every 100 watts of output from your tranceiver, fewer than 5 watts are actually radiated. The other 95 watts dissipate as heat. No wonder that mobile signal is "wimpy, wimpy, wimpy."

Why is a mobile antenna so inefficient, and what can we do about it? If you hadn't guessed it by now, that's what this month's column is about.

Just a Little Theory

I'll discuss some practical ways to improve mobile antenna efficiency a little later on, but first we should understand why the efficiency of these antennas is so low.

We all know that resistors absorb power. Antennas have a characteristic known as "radiation resistance." Power "dissipated" in the radiation resistance, R_R, is the power radiated. Antenna systems have other resistances associated with them, including the resistance present in the ground, R_G, and the resistance due to any loading coils, R_C. The total resistance, R_T, can be expressed as:

$$R_T = R_R + R_G + R_C \quad (1)$$

The power applied to the antenna is divided among these various resistances, so you can see that having a low radiation resistance in the face of high R_G or R_C makes for a poor radiator. In fact, we can define the percent efficiency, n, of the antenna as:

$$n = R_R/R_T \times 100 \quad (2)$$

I won't give you the equations that allow you to calculate the radiation resistance of a given antenna here. Suffice it to say that for short vertical whips, R_R is proportional to the square of the antenna's length. (1, 9)

We have a number of theoretical terms floating around now, so on to a concrete example. Let's

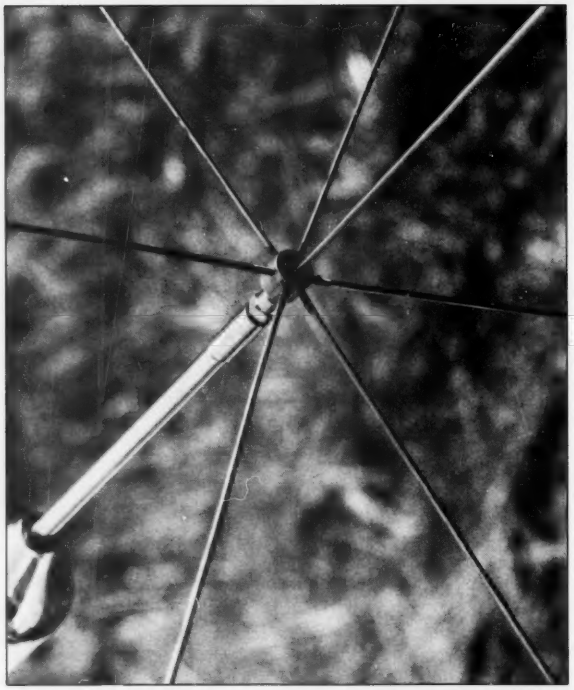

Photo A. Close-up view of a top-hat, approximately 2 feet in diameter. It is fashioned from 6 stainless steel bicycle spokes and a piece of scrap aluminum. Spoke threads are 2-56. (Not all spokes are that size!) Set screws in the aluminum collar hold the top hat in place.

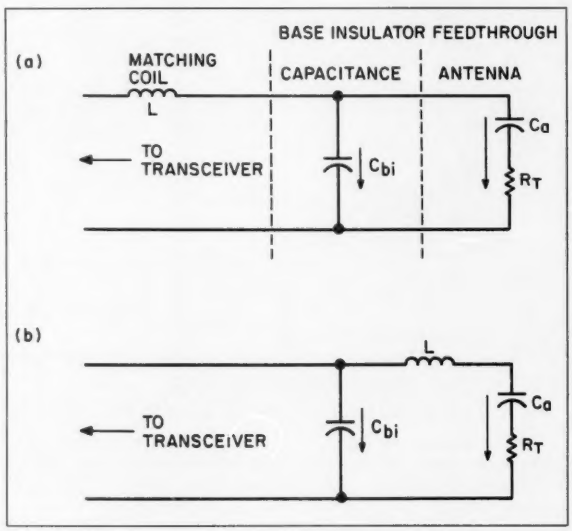

Fig. 2. Less desirable (a) and preferred (b) methods of positioning base-loading coil. When L is placed inside a metal vehicle (a), significant non-radiating current can flow through the base insulator feedthrough capacitance, C_{bi}. (From Belrose, Ref. 1).

assume our antenna is 8-feet long, center-loaded, and that we'll operate at 3.8 MHz. R_R for this antenna is about 0.8 Ohms. A typical value for R_G at this frequency is 10 Ohms. The resistance of the coil to produce resonance will vary with its quality (Q). A good coil (Q = 300) for this antenna would have a resistance of about 12 Ohms, (1, 9) while a coil of lesser quality (Q = 50) might have a resistance of 70 Ohms. (9) Putting the above values into equation (2),

$$n_1 = 0.8/(0.8 + 10 + 12) \times 100$$
$$n_1 = 3.5\%$$
$$n_2 = 0.8/(0.8 + 10 + 70) \times 100$$
$$n_2 = 1.0\%$$

where n_1 = the efficiency of the antenna with the low-loss coil, and n_2 = antenna efficiency with the higher-loss coil. You can see that the power out from the lower-loss system is up 5.4 dB. Now you know why some of us drive around with "oversize" resonator coils, even though we are only running 100-W! Typical efficiencies for a base-loaded 102-inch whip antenna appear in Table 1. (Table 1 also contains inductance values that will allow you to make an inexpensive amateur mobile antenna from a 102" CB whip).

Play a little with equation 2 and your calculator and you'll realize why mobile antennas can be so inefficient in the lower HF range. It's not that the radiation resistance is low, but rather that R_R is low in relation to the other losses—R_G and R_C. To increase the amount of signal radiated, we can: 1) add an amplifier; 2) increase R_R; 3) decrease R_G; 4) decrease R_C; 5) some combination of the preceeding four. I'll leave it to you to deal with an amplifier, while I'll discuss the other avenues of approach.

Increase R_R

As I mentioned earlier, R_R increases with the square of the antenna length. If we increase the length of the whip in the example above from 96" (8') to 144" (12'), R_R will increase from 0.8 Ohms to 1.9 Ohms. If we keep other losses constant, the efficiency would rise from the 3.5% given above to nearly 8%. The antenna still radiates only 8 out of every 100 watts, but that's 2.6 times, or 4.15 dB, better than before. Actually, the increase in efficiency would be even greater, since the longer antenna would require a smaller loading coil (lower R_C). The wrench in the works: keeping a 12-feetlong antenna attached to your vehicle at freeway speeds. You'll also have to figure out how to negotiate the low power lines and trees along your local streets, and to be legal in this part of the country you have to keep the maximum vehicle height below 14 feet. If you want to build an efficient mobile antenna (and antennas such as this are roaming the highways), this is one approach to consider.

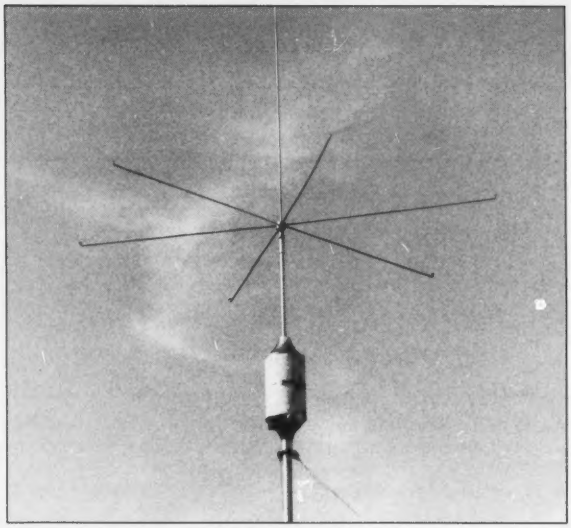

Photo B. A Hustler 20-m resonator with a top hat two feet in diameter. The system resonates in the 30-m band.

If the mechanical problems associated with a long whip seem too formidable, or if you want to stick with commercially-made antennas when going mobile, you can still increase R_R, and thus the efficiency of your system. Pull off to the side of the road, remove that resonator, and attach enough wire to the remaining mast so that you have a full quarter-wave on the frequency of interest. R_R is now approximately 35 Ohms, while R_C has disappeared. The efficiency may climb to 75% if you find a high end support. There will be less, although still worthwhile, improvement, if the antenna runs more horizontally. I have used this approach with good success. You can even use multi-conductor cable, such as rotor control cable, to make "parallel monopoles" for multi-band operation. True, it's not strictly a mobile antenna, but if you can arrange your schedules to coincide with your rest stops, or vice versa, it can mean the difference between a solid contact and being told you're +"20 under."

What if you pull into a rest stop and find no room to string the wire? I know of a W6 who uses a mobile antenna that can be retracted for use on the highway, or considerably extended for improved operation when at rest. I have replaced the resonator (only) of my Hustler antenna with a 102-inch CB whip (Photo A). The addition of a top hat two feet in diameter (photo B) makes this antenna resonate in the 20-m band with no need for a loading coil. Mechanically, this arrangement leaves something to be desired, but received signals are 5 to 10 dB better than with the stock Hustler. So it is not without potential.

f(MHz)	1.8	3.8	7.2	10.125	14.2	21.25	24.95
R_R (Ω)	0.11	0.47	1.7	3.5	7.3	19.1	29
LoadingL (μH)	273	61	16	7.7	3.4	0.9	0.3
R_CΩ (Q = 50)	61	29	14	9	6	2.4	2
R_CΩ (Q = 300)	10	5	2.4	1.5	1.0	0.4	0.3
Q = 50	0.2	1.2	6.6	17	40	85	91
Q = 300	0.5	3.0	12	27	55	93	96

Table 1. Approximate values for a 102-inch mobile whip with base-loading and average diameter of 3.16 inch (equivalent to a CB whip).

Reducing R_G

As long as you are moving, you have little control of ground losses. However, you can increase the efficiency of a mobile antenna at rest by laying out ground wires attached to the vehicle's frame. Since only a few radials are used, they need not be a full ¼ wavelength long—I have used 33-feet long (⅛ wavelength) radials while operating on 75 meters with good results. Some people (1) have reported significant (10 dB) increases in transmitted signal strength with a single radial laid out in the direction of propagation. I have not noticed an improvement when using a single radial in that manner (frequency of 3.8 MHz, radial length 66', stock Hustler 75-m antenna, car parked in a wheat field). However, I did note a small (1 to 2 dB) increase in received signal strength when I added a second wire, and a 3-dB improvement when I used four radials. The maximum benefit requires proper orientation of the radials—see figure 1. I would expect greater improvement with the use of radials when parked over ground of less conductivity than the farmland I used when I did these tests.

Reducing R_C

If you aren't quite convinced that the loading coil on your expensive commercial mobile antenna can actually dissipate over half of your transmitter's output power as heat, give a long transmission sometime and then step outside and feel how warm the coil is. Or you could do as an acquaintance of mine (who shall remain nameless) did and apply the output of a kilowatt amplifier to your low-power resonator and watch the coil catch fire. A low-loss coil is a high-Q coil and will be wound of large diameter wire on a low-loss form with a relatively large diameter-to-length ratio. Such a coil is not difficult to make on the bench, but incorporating it into a mobile antenna system while maintaining structural integrity is not so easy.

You can compare the quality of

coils you wind yourself against one another or with commercial versions by noting the antenna SWR at resonance, with no matching devices in place. If two coils each resonate the antenna at 3800 kHz, for instance, the coil that produces the highest SWR will be the most efficient one. (9) How can that be? Look again at equation 1. In this case only the coil (R_C) is being changed, so R_R and R_G are constant. Decreasing the value of R_C causes R_T to decrease, and so the SWR rises. Recall that SWR is proportional to Z_O/R_T, where Z_O is the impedance of the feedline. At home or mobile, whenever you have a simple monopole with a low SWR over a wide frequency range, suspect high losses in the loading coil, ground system, or both.

If you shy away from winding your own coils, there's still hope for reducing R_C losses while using commercial resonator coils. You can use a coil for a higher band by adding a capacitive top hat and increasing the length of the whip above the resonator. Photo C shows how I could resonate a Hustler 20-m resonator on the 30-m band by the use of such a top hat. From time to time, I attempt to resonate my 40-m system in the 75-m phone band by adding a large top hat and increasing the length of the whip above the resonator, but I have yet to come up with a combination that is a satisfactory compromise between mechanical stability and downright ugliness. Such an arrangement should give a worthwhile improvement when compared with the standard 75-m system, however, since R_R is increased by the increased antenna length, while R_C is decreased due to the smaller size of the loading coil.

Regarding top hats: If they are placed too near the loading coil, they can actually increase coil losses. (9) As I discussed above, increased losses can mean lower antenna system SWR due to decreased efficiency, which is the opposite of what you want.

Speaking of matching, if your antenna uses base loading, install the loading coil on the outside of the vehicle. (1) With the coil installed inside the car, a significant, non-radiating, current can flow through the capacitance (typically 3–15 pF) of the feedthrough insulator. When the coil is located outside the vehicle, the feedthrough capacitance is unimportant. See Figure 2. Also, you should avoid the combination of bumper-mounting and base-loading if it places the loading coil in close proximity to the car's metal body.

"Whenever you have a simple monopole with a low SWR over a wide frequency range, suspect high losses in the loading coil, ground system, or both."

Another method to decrease the amount of inductance, and hence R_C, for a given length of antenna is to increase the antenna's diameter. For example, a 102-inch whip with a diameter of 3.16" requires about 61 µH to resonate it on 3.8 MHz when base-loaded. An antenna of the same length but of 1½" diameter will resonate on the same frequency with only 37 µH of inductance. The formula for making these calculations (for base-loaded antennas) is:

$$L(\mu H) = 60(\ln \frac{h}{a} - 1)(\cot G)/2\pi f \quad (3)$$

Where: h = height of antenna in inches
a = diameter of antenna in inches
G = electrical height of antenna in degrees
f = frequency in MHz

Combinations and Other Possibilities

As I hope you have gathered by now, mobile antenna systems for lower HF bands leave a lot of room for improvement. Achieving marked improvement over compact commercial antennas is mainly limited by structural considerations and your willingness to appreciate the "functional beauty" of your creation in the face of comments from family members and stares from passersby. If you are really adventuresome, you might like to try a loop antenna—these have been described for mobile use in both the professional (2) and amateur (5, 6, 7) literature, and can outperform vertical whips. If you have the time to pull off to the side of the road, lay out a few radials, and extend or otherwise modify the mobile antenna temporarily, you can boost your signal strength more than if you had switched on an amplifier. Another possibilty is a temporary mast-mount on a metal plate. You can construct a portable mast from inexpensive TV antenna mast section five feet long, and use it to support a wire dipole. The base plate is held secure by the weight of the vehicle. Signal strength improvement relative to common mobile whip is likely to exceed that due to adding an amplifier, also works on receive, and costs much less. To erect this system, just pull to a stop, drive a wheel up onto one end of the plate, put a few telescoping sections of tubing together, and you have a support for a dipole/inverted-vee that even at 15 feet will outperform most verticals in that situation.

Here are some ideas to start with. Check the references for some more, especially Belrose (1) for information on calculating R_{RV} and necessary matching inductance for base-, center-, and helically-loaded antennas. 73

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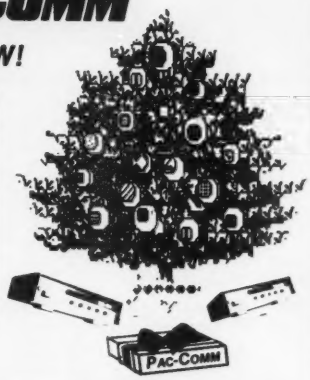

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The WB8ELK helium-filled balloon carrying Fast Scan TV launched from Findlay, Ohio, August 15th has been recovered with its video package intact. A farmer harvesting his crops not far from the launch point discovered the balloon. The $500 airborne ATV platform went out of sight at 100,000 feet after sending some great computerized ATV pictures at 439.25 MHz on UHF over a reported QSL distance of more than 400 miles. Hams in eight states reported reception of the signals. The balloon was lost and presumed down somewhere within a 50-mile radius, or possibly even caught in the jet stream and headed for the East Coast.

Bill Brown WB8ELK called me the other night on 3.990 MHz, over-joyous to report that the balloon and its package were found. When the farmer stopped harvesting the corn late one night, he parked the tractor where it stood and went back to his house. The next morning at daylight, he was back at it again, and noticed a white styroform package laying just a couple feet from his combine in the path of the harvester about to be gobbled up! He stopped at just the right time late the night before! Bill and the Findlay, Ohio, ATV gang had a return address and reward designator on the package in case someone did recover the balloon, and it really paid off. Bill ran tests on most of the electronic components, and all looked okay. His event report can be found in the September/October issue, Volume 17 Number 8 issue of The Spec-Com Journal.

This was a happy ending to the midwest's most exciting 1987 summer event. Some 100 ATV enthusiasts checked in on the 40/80 meter ATV nets, and another estimated 300-400 hams watched for the signals. Signals made it all the way to New York (W2RPO) and to the west with KB9FO and K9MTE at P3 levels and N9AB at P2. The CW ID'er was heard in St. Louis, Moline (N9AEP), Baltimore (N3AGG) and elsewhere. It was quite a day, and hopefully you were there to participate! This was certainly yet another great innovation for the use of the ATV mode. Bill and his crew plan a similar launch in the spring of 1988. Bill states special thanks to NR8Q, WA8GAU, WA8VWY (followed the balloon by aircraft!), WB8MSJ, KA8LWR, W8VKR, WA8HDX, N8DOO, KA8WLV, W8RSK, WA3USG, the Iowa BRATS ATV GROUP, The Spec-Com Journal and W6ORG of P.C. ELectronics.

New 40/80 Meter FSTV Net Frequencies!

One of the neat things to come out of the WB8ELK FSTV balloon project was the incredible amount of people that came on regularly on 40 and 80 meters. I used to sponsor and help W9ZIH conduct a regular Saturday net on 7.290 MHz a few years ago. We had 20-40 regular participants, but it died as 40 meters did for the summer. I never got it restarted. A successful net needs committment including regular participation and assigned net controllers. Bill WB8ELK in Findlay, Dave WB0ZJP in St. Louis, Henry KB9FO in Chicago and I have been giving some serious thought to start the HF ATV nets and "talk spot" frequencies going again! So, here is our offical 73 magazine notification. The nets will meet on 7.230 and 3.860 MHz. These frequecies have already been mentioned in The USATVS Journal classified ad section. Fast Scanners have already started to coordinate DX contacts during band openings and just friendly HAM-TV chitchat since early October.

The frequencies may change ± 5 kHz, depending on band conditions and QRM. If someone would like to get an international or net going on twenty meters, we need volunteer net controllers. These forty- and eighty-meter frequencies will become the spots to listen and talk to other regional ATV enthusiasts. They will most likely be around early in the morings between 6 and 9 AM for any DX band enhancements (while transmitting FSTV signals east and west on UHF), and on weekends on Saturday and Sunday. WB8ELK, WB0ZJP, KB9FO and WB0QCD have consented to take net controller positions on Sunday mornings at 0800 AM (Central time). We need your participation!

Check in and keep up with the latest news going on in HAM-TV! You active Fast Scanners pass the word about these frequencies to others, OK? Route any HAM-TV related PACKET RADIO messages to WB8ELK via N8ET PBBS in Ohio or to me WB0QCD via WA0RJT PBBS in Cedar Rapids, Iowa. We will answer them. By the way, the September/October issue of SPEC-COM also listed 421 W0RLI PBBS systems, if you need to figure out the best routings to your packet buddy. (Sample copy available for $2.50 ppd. Specify this particular issue.) The frequencies list above, may not be cast in stone (pardon the pun).

I picked them mainly to give those who have general class licenses a chance to participate. It's a good place to start. Now just don't sit there and listen to the static when looking for ATVers on 40 or 80 meters. Tune up that dummy load and put out several calls our way, OK? An intercontinental ATV net frequency? How about 14.240 MHz just above the SSTV calling and operating area? You call it, and I'll publish it!

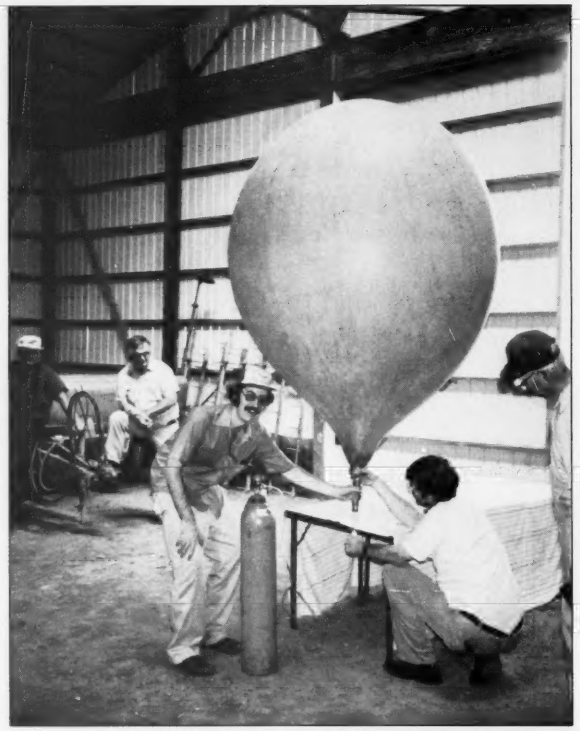

Photo A. Bill Brown WB8ELK and the rest of the Findlay, Ohio, ATV group prepare their helium balloon and FSTV package for launch. Hams in eight states reported signals from the balloon.

"If it sounds like I am depressed about SSTV, I am."

Lack Of SSTV Information

The mail here at 73 has been running far ahead for FSTV comments over SSTV ones. That isn't surprising. SSTV never has had available a monumental wealth of technical information. There are very few builders in SSTV anymore, mostly "appliance operators" like myself. Buy it and hook up a camera. I have had 3 ROBOT 400's, 3 German WRAASE converters (SC-421 and 422 and SC1), 2 ROBOT 1200C's and a

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CIRCLE 194 ON READER SERVICE CARD

host of "interfaceless" low-resolution, computer SSTV programs for the TRS80C CoCo, the C64 Commodore and the IBM PC Clone (Tandy 640K 1000SX). Every once in awhile I get enthused about SSTV, get on-the-air, then listen to the bunch of malarky from several self-esteemed operators on how great they think they are. I get turned off and get involved in something else. Recently I had been off the air on SSTV for about 6 months. I put AC to the 1200C, tuned up on 14.230 MHz and the first thing I heard was a chap out east still pushing for dues the dead IVCA Club to those newcomers who unfortunately checked into their net. Some things never change. If it sounds like I am depressed about SSTV, I am. It seems to be going nowhere.

Photo B. Henry Ruh KB9FO and Mike Stone WB0QCD show off with Dr. Tony England W0ORE at the Peoria, Illinois, Superfest in September. Dr. England sent SSTV pictures from Space Shuttle Mission 51H more than two years ago.

Yes, the color and high resolution is great. I marvel at most of the pictures being sent. But how often do you see a live shot? You know, a mug shot? Hardly ever. "Here comes a (illegal) picture that I just snatched of the TV, Bill, 5-4-3-2-1," says one SSTVer. You see, I have a 525 line, NTSC, excellent resolution picture already in my shack of that sent SSTV frame. Why am I suppose to get a kick out of seeing it again–even at half-resolution across the country? SSTV today lacks originality. Originality might make up for the lack of technical experimentation that SSTV endures today. To me, it's more fun looking for those new guys who just picked up a ROBOT 400 black/white converter for $100 at the local hamfest. They appreciate live pictures. OK, I'll grant you that a national column editor about ATV (all modes of HAM-TV) shouldn't be so depressed about one of the represented modes.

So impress me! How about some of you out there taking pens in hand and submitting some material to publish in 73 or SPEC-COM? Fred Sharp W8ASF in Cleveland has regular monthly allotted space for SSTV, yet he gets little response. I would be glad to devote more SSTV comments, articles and pictures to this column each month. Send some material, please! Otherwise read about all the neat things going on in Fast Scan TV.

"Please go back through your SSTV tapes, snatch a good color or black and white shuttle picture, and reprocess it onto a new tape."

SSTV Shuttle Tape Request by W0ORE

Where did everyone go after Tony and crew flew the Challenger into SSTV history? 14.230 is once again smothered to death with the power hungry, DXers and their 5 by 9 reports on what else but prearranged "telephone lists." Speaking of NASA's Tony England W0ORE, I had a chance to meet and talk with him at the Peoria Superfest on September 19th and 20th. Surprisingly, he has seen very little of the captured SSTV pictures sent to all of us here on earth.

I asked Tony if he would like an assembled cassette of many SSTV pictures sent to all of us here on earth. I asked Tony if he would like an assembled cassette of many SSTV pictures from space and he said that it would be very nice. In the November issue of SPEC-COM, we announced a call for Mission 51H Space Shuttle SSTV pictures sent to earth from one of the last flight of the Challenger. Please go back through your SSTV tapes, snatch a good color or black and white shuttle picture and reprocess it onto a new tape. Document time, date, location of shuttle and orbit if possible. Send it to us. We will transfer and combine these captured pictures into one C30 or C60 tape package and present it to Tony probably at Dayton. Your submitted pictures will be accredited. I can't promise, but Tony had extra 8 x 10 color photos of himself at Peoria that he would probably be willing to part with.

If I can't get any from NASA, Tony or Lou W5DID at JSC ARC, then I'll ask Wayne Green for a few of his before he lost weight. You're right. Since he is running for Vice-President, Wayne probably got rid of all of those ones for the new, thinner prints. NOTE: Send along an extra blank tape, and I will make a copy of the final version for you at no charge! There is one catch though...don't be in a hurry to get them back. This project will no doubt take months to complete. So be patient and the tape will find it's way back to your mailbox sometime in 1988. OK? I knew I could count on you. Tony says thanks too!

More Questions and Answers!

We got a lot of response the last time we did a Question and Answer session about HAM-TV. So here goes another one.

Question: I am new to FSTV on UHF. What type of coax should I use? I have a friend who has some 75 Ohm CATV stuff, ½ inch I think - is that OK?

Answer: Free is free, I guess, and you get what you pay for. If that is the best you can afford, then use it. The 70-75 ohm impedance mismatch isn't too bad for receive only. However, if you can afford to get a chunk of Belden 8214 or preferably 9913 (or an equivalent like Columbia 1180) then do it. There is a tremendous amount of loss on UHF through connectors, the coaxial transmission line, etc. Do it wrong, and you'll pay for it on the other end!

Question: Should I use vertical or horizontal polarization on my ATV antenna?

Answer: Look around you (out to several hundred miles) and see what polarization others in your area use. Which way you go makes little performance difference. Getting the right polarization for the operators in your area IS important. The wrong polarization can lose 20 dB of signal strength! Find the other operators on two meters, or take a look at the FSTV antenna polarization map in The North American FSTV Guide Booklet ($5.95).

Question: Color has always been a problem passing through our ATV Repeater. Yet, our color bar display from the remote transmitter works just fine on our 426.25 MHz output. What gives?

Answer: It is tough to troubleshoot by letter. Check your repeater's TV set or TV demodulator processor board. This is the circuit that takes an incoming signal, processes it and sends it out again in video form. At our system in Davenport, we passed color in what we called MODE-A (remote transmitter) position but passed poor color on none at all in the MODE-B Fast Scan TV Repeater. I set up an independent, known, good color TV set and a receive downconverter and began adjusting the pots in our Motorola Quasar VCR tuner TV receiver board and brought nearly 3 years worth of frustration to an end! My other electronic companion buddy was always afraid to mess with it since we didn't have much information about the unit. I got brave and lucky. We now pass great color and audio subcarrier sound. Experiment intelligently. That is what the hobby is all about. 73's until next column, gang! de Mike WB0QCD. 73

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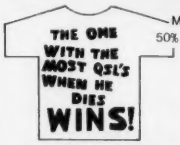

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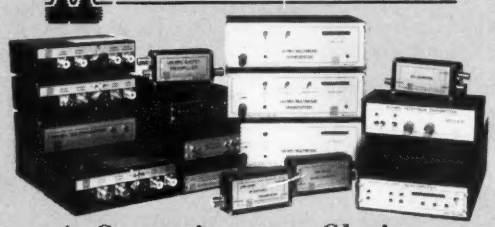

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DOWKEY	DK-119	SPDT gold	200 watts	N / A	32 vdc	SMC 2.4gc	$75 ea
DOWKEY	DK-137	SPDT gold	1500 watts	N / A	28 vdc	BNC 500mc coaxial	$95 ea
DOWKEY	DK-140	SPDT gold	1000 watts	N / A	28 vdc	UG-58 40 mhz	$40 ea
JENNINGS	RF-41	SPST N/C	12	3.6	26.5 vdc	VACUUM	$39 ea
JENNINGS	RF-42	SPST N/O	12	3.6	26.5 vdc	VACUUM	$39 ea
JENNINGS	RF-43	SPST LATCHING	12	7	26.5 vdc	VACUUM	$50 ea
JENNINGS	RF1E	SPDT	8	2	26.5 vdc	VACUUM	$45 ea
JENNINGS	RF1J	SPDT LATCHING	12	3.6	26.5 vdc	VACUUM	$65 ea
JENNINGS	RJ2A	SPDT	50	12	26.5 vdc	VACUUM	$125 ea
JENNINGS	RB2A	DPDT	20	20	26.5 vdc	VACUUM	$175 ea
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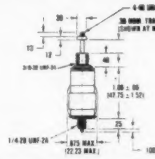

CIRCLE 266 ON READER SERVICE CARD

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SPECIAL EVENTS

Ham Doings Across the Country

Special Events listings will be provided by 73 magazine free of charge on a space-available basis. Announcements must be received by us by the first of the month, two months prior to the month in which the event takes place (by March 1, for example, for a May or later event). Please mail to Editorial Offices, 73 Magazine, WGE Center, Peterborough NH 03458.

BETHLEHEM CT
DEC 1–31

For the whole month of December the Hen House Gang Amateur Radio Club will be holding the Bethlehem Christmas Special. All ages welcome. And the frequencies will be on 10–80 meters and Novice on 40 CW. For more information send a first class stamp (only) to *W1FHP, Hard Hill Road, Bethlehem CT 06751.*

FARIBAULT MN
DEC 5

The Annual Handi-Ham Winter Hamfest will be held Saturday, December 5, 1987, at the Eagles Club in Faribault, Minnesota starting with registration at 9 AM. There will be a Handi-Ham Equipment Auction, dinner at noon and a program. Amateur radio license exams will also be given. Talk in on 19/79. For more information contact *Don Franz W0FIT, 1114 Frank Avenue, Albert Lea MN 56007.*

APACHE JUNCTION AZ
DEC 5–6

You are cordially invited to spend a weekend in Apache Junction Arizona on the weekend of December 5–6, 1987, at SUPERSTITION HAMFEST 87, sponsored by the Superstition Amater Radio Club. There will be free camping on the grounds Friday and Saturday nights (self-contained), with swap and shop opening at 7 AM Saturday and closing at 2 PM Sunday. A test booth with 120 VAC and antennas will be available for testing of gear before purchase. The Hamfest is located on the rodeo grounds at the NW corner of Brown Road and Meridian, 1½ miles north of US 60 on the west side of Apache Junction. Primary Talk-in is 147.12 RPT and 223.5 mHz simplex. Other area repeaters include 146.72, 146.74, 145.41, 146.94, 223.82 and 224.94 MHz. For more information contact *Superstition Amateur Radio Club, Inc., P.O. Box 1551, Apache Junction AZ 85217-1551 (602/986-2298–ask for Larry).*

NEWCASTLE DE
DEC 5–6

The First State ARC will operate special event station, K200QBD from The Old State Capitol in Newcastle, Delaware, on December 5–6 in celebration of the 200th anniversary of Delaware's signing of the Declaration of Independence. Look on the 80-15 meter bands and the 25 kHz ± QRM up from the lower end of General phone bands and the 10 meter Novice phone band. For certificate send QSL and large SASE to *FSARC, P.O. Box 1050, Newark DE 19720.*

MILFORD MI
DEC 6

The Hazel Park Amateur Radio Club will hold its 22nd Annual Swap and Shop on December 6, 1987, at the Hazel Park High School, 23400 Hughes. General admission is $2 advance, $3 at the door. Children under 11 years are free. Plenty of free parking. Talk-in from the 9-mile and I-75 area on 146.52 simplex. For tickets and table reservations, mail to *H.P.A.R.C., P.O. Box 368, Hazel Park MI 48030.*

ATHENS OH
DEC 12–13

The Athens County Amateur Radio Association will operate special event station, WD8OXX, on December 12th and the 13th, to celebrate the 200th anniversary of the Northwest Ordinance from the home of Ohio University, first public university in the territory. Operation from 1500Z till 2300Z each day. Suggested frequencies: lower portions of the General 80, 40, 20, 15 and 6-meter bands. Novice phone: ± 28.400. For certificate, send QSL and large SASE to: *Jeffrey White WD8OXK, P.O. Box 73, Athens OH 45701-0073.*

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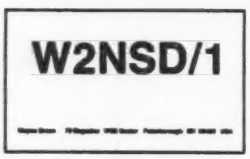

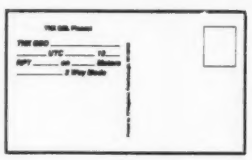

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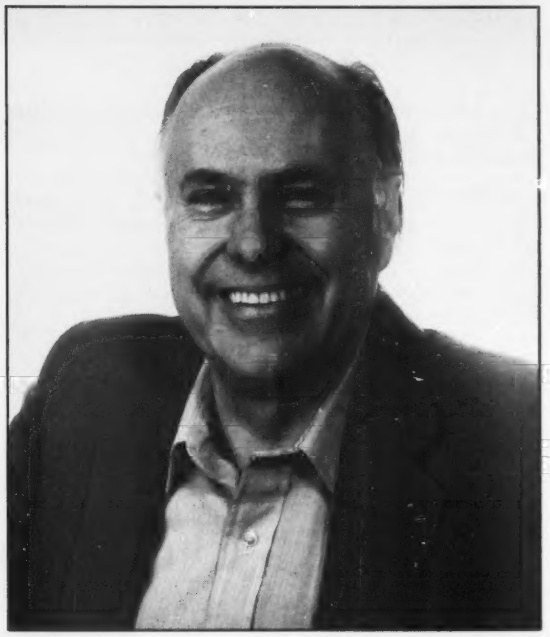
Getting Rich In The Ham Market



Every time two hams get together at least one says how about if we were to make this great product to sell to hams—not realizing that the ham "industry" is probably one of the best possible ways to guarantee poverty.

No, not all hams are cheap—not all are living on starvation retirement payments—the fact is that some ham firms are doing remarkably well selling to those few hams who are alive and well—and to the handful of newcomers who blunder into our hobby.

The whole trick to survival in the ham market is in getting your sales message to your potential customers—this is called marketing. Marketing includes making sure your literature is as good as (or even better than) your product—and that your sales pitch reaches those few live hams who are your best potential customers.

I'll bet you thought I was never going to mention *73*. Advertising is going to be one of your biggest sales expenses, so give it the serious thought it rates. Advertising is a very well-developed art—billions have been spent on research to find out what works and what doesn't. Indeed, I'm working on a video just on how to advertise. In the meanwhile, if you can take it, I'll mercilessly criticize your literature and your ads—a service no other ham magazine can provide at any price because none of them have anyone with anything even remotely like the 35 years I've had in advertising to hams. Unless you fall in it, it's unlikely you're going to find an ad agency able to help you sell to hams—which is, to be kind, a unique group.

Presuming that sales are of some importance to you, where do you think you'll do best? There are four ham magazines—one for advanced builders—one for contest fanatics—one for ARRL fans—and then there's *73*—which appeals to active hams with small construction projects, with the only world DX column, with columns and news about all of the new ham activities such as packet, RTTY, Oscar and so on. The *73* readers buy circles around other magazine readers because they're active and motivated.

So if you decide to try and fight the odds with a ham product, give it your best shot with *73*—and let me help you win with powerful, sales-oriented literature and ads. A little mail order business at home is a great way to become independent—millions are doing it. Remember, small business is the real strength of America . . . and it's about the only practical way to have a crack at making big money these days.

Write or call the *73* advertising people—Sam or Ed—and let's get you started with power ads which will make you money.

. . . Wayne
W2NSD/1

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VFO FOR THE 6L6

I'm still going over all the letters that the 6L6 Special generated. With a bit of luck, I'll have the update ready for next month. However, a letter from Wayne Sandford, Jr. K3EQ caught my eye. Wayne wrote to say he built a VFO for the little one-tuber since he never liked crystals. I wrote back to Wayne asking him for a copy of his VFO schematic. Figures 1–3 illustrate his project.

Now, there are VFOs and then there are VFOs. Wayne's version is something special. The heart of his circuit is a Collins Type 70 H-13 PTO. This is what gives his VFO that rock-solid tone. Wayne writes, "This PTO is small—about 1" by 3" by 5". I removed the two miniature tubes and substituted MPF-102 transistors. The PTO has a thermostat and heater, which are left on all the time. Extensive tests with a good frequency counter show that the frequency varies up and down no more than about 20 Hz as the heater cycles on and off."

The output of the VFO is 3.5 to 4.0 MHz. The transmitter will double the output for use on 40 meters. The Collins PTO may not be easy to find. Fair Radio Sales listed suitable replacement in their catalog, the T195 PTO. Wayne tells me that the new PTO works very well. He uses the same circuit that works with the Collins unit. The Cs and Ls in the Pi tanks were doubled. This new VFO has an output from 1.75 to 2.0 MHz. Now here is your gateway to 160 meters. The 6L6 Special will not have enough drive to quadruple the output for 40 meters without the use of a outboard doubler circuit when using the PTO from Fair Radio Sales.

Inside the Circuit

Let's look a bit closer at the VFO circuit, starting with the PTO (fig. 1). One MPF-102 comprises the oscillator. The Collins PTO contains all the frequency-dependent components. A 1N3018 zener diode holds the voltage steady at 8.2 volts. A second MPF-102 transistor amplifies the output for the next stage, the buffer amplifier.

As the name implies, the buffer amplifier (fig. 2) isolates the 6L6 from the PTO, and at the same times provides a signal increase. The 2N2222 transistor amplifies the PTO signal while the Pi output tunes the circuit for maximum signal at 4 MHz. A second transistor, a 2N3553 or 2N3866, again amplifies the signal to a level needed for the 6L6. The output of this amplifier is again tuned to 4 MHz using a second Pi section. The PTO operates all the time, the buffer-amplifier is keyed on and off. To keep the receiver from hearing the PTO, some method of shifting the PTO's frequency will be needed. While Wayne did in fact mention this, I did not include the schematic.

Wayne uses differential keying. The oscillator always comes on first and goes off last, and all keying filters are in the final-stage cathode. The oscillator (PTO) is always on. When the key is up, the frequency is shifted lower by about 25 kHz, so you never hear it. Since Wayne added more stages in his version of the 6L6 Special, his keying scheme may not work with the original. If you're interested, drop Wayne a letter. I'm sure he would be glad to share his offset circuit with the readers of the QRP column.

Lest we forget, the power supply. Very simple. A five-volt regulator is used as the heart of the supply. By varying the ground connection via a pot, we can make the LM309 adjustable. The stand-by switch removes power from the buffer-amplifier, and PTO. Even with the stand-by switch turning off the main VFO circuits, the power to the heater is still allowed to flow. This will keep the VFO stable even though the unit is in stand-by. The required voltage for the heater is generated by a voltage doubler. If you use the unit from Fair Radio, the PTO requires only 14 volts rather than the 24 volts for the Collins unit.

Remember, this is not a step-by-step construction project. If you use the PTO from Fair Radio, the frequency-determining components in the buffer amp will have to be changed. Also, without the offset circuit, you'll hear the VFO on your receiver. Since it is not possible to design a universal keying circuit for all those different versions of the 6L6 Special, keying the VFO will be up to the individual user.

Since I have not had time to give Wayne's circuit a workout on my test bench, I can't answer questions about it. Write to Wayne Sandford, Jr., P.O. Box 395, Warrington PA 18976 and include a SASE and if asking for copies of circuits (add a few bucks to cover copying costs.)

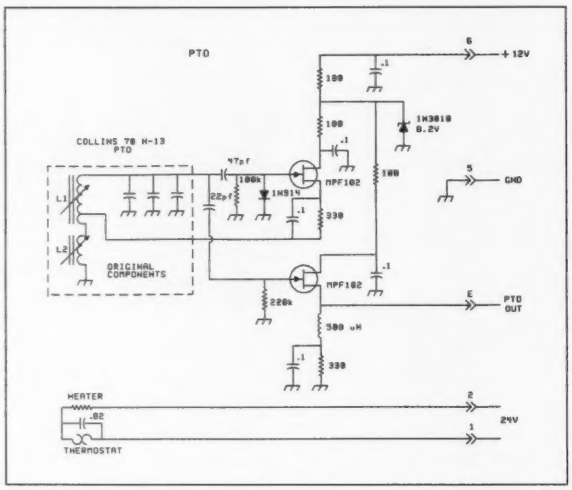

Fig. 1. The Collins 70 H-13 PTO, the heart of the VFO for the one-tuber.

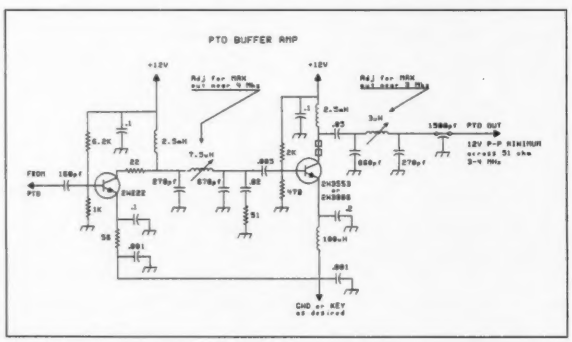

Fig. 2. PTO Buffer Amp, the second stage of the VFO.

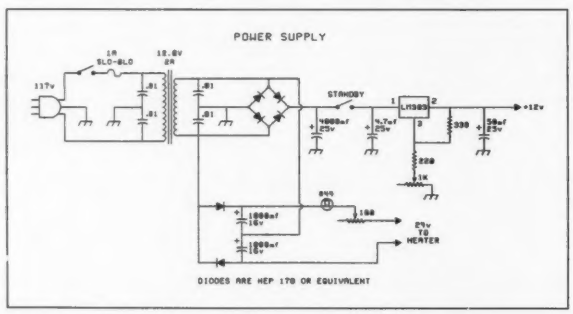

Fig. 3. Power supply circuit for the Collins PTO.

Odds n' Ends

For those of you who put off buying a HW-8 Handbook, you're out of luck. All 500 copies have been sold. I might do a reprint somewhwere down the line, and I am looking for more mods for this little critter. Anyone for 18 MHz on the HW-8?

Just when you thought it was safe to stop reading about QRP, Jerry NR5A compiled an intensive list of QRP projects and mods. Write to Jerry for your own copy,

or contact him via Compuserve ID 73230,626. As well, Michael Hopkins WD5GMP has been busy putting together a collections of modifications for the Heath HW-16. While not exactly a QRP radio, the HW-16 can easily be turned down to QRP levels. A no-part QRP conversion for the HW-16 was described by Ade Weiss, WØRSP, in his book, The Joy of QRP, Strategy for Success. At today's hamfest prices, an HW-16 can be had for 10–30 dollars. The matching HG-10B VFO will cost more than the main rig! If you have done some QRP work with this radio, let us know.

I have been starting to collect information on a second book—solar power for the ham operator. I have mentioned before that I operate my complete station—several computers, Packet digi, and yes, even a 200-watt HF transceiver—from the sun's energy. If you are running your shack from the sun's energy, how about helping out in this effort?

Do you own or operate a NCG-15? Have you made any modifications to it? If so, drop a line to me about it. I've had some requests on the subject. Since I have never operated one, I was unable to help.

Looks like there is considerable interest in the Two-Fer. I was able to get some more boards made up. If you have not sent for the info kit by now, it may be too late. Again, if I can get the minimum number of interested people, I'll reorder the boards.

That's a very handsome-looking plaque that Fred Trupin had made for the Two-Fer contest. I would like to see a major QRP award given away—something akin to Ade's Milliwatt DXCC trophy. I'm talking about a trophy from me for the best QRPer in the land. I want to see someone whom has been a dedicated QRPer win a nice-sized trophy—it could be for Field Day, Sweep Stakes, 6L6 Special contacts, or what have you.

Coming up next month will be the 6L6 Special update with a lot of photographs and circuits. My QRP 5er will be showcased soon, as will other projects. If you build, or modify your commercial equipment, share your work with others here in the QRP column.

The Christmas season is upon us. . . everyone have a safe and happy holiday season! 73

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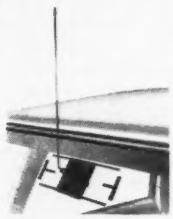

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PHASE 3

The AMSAT Phase 3C Launch Campaign officially began September 16, 1987, with the successful resumption of Ariane missions by the European Space Agency (ESA). Their launch program has been on hold since the disastrous Ariane flight V18 in late May of last year. The third stage failed to ignite, and the range safety officer was forced to transmit the destruct command to the vehicle.

The September V19 launch of an Australian communications satellite, AUSSAT 3, and the EUTELSAT (European Telecommuni-cations Satellite Organization) ECS 4, brings the European consortium Arianespace back on a launch schedule that hopes for 44 more satellites in orbit via Ariane rockets over the next three to four years.

Phase 3C waits among those future satellites for the chance to become an OSCAR. Only when it achieves orbit does the title "Orbiting Satellite Carrying Amateur Radio" apply. Gordon Hardman KE3D in Colorado installed the new radiation-hardened memory chips, donated by the Harris Corporation, in the Integrated Housekeeping Unit (IHU). The finished unit was then sent to West Germany for integration into the satellite by AMSAT DL. Phase 3C is ready for launch, and mission V22 may come as early as January 1988.

Ariane's 8th Anniversary

The Ariane program celebrates the eighth anniversary of the first Ariane 1 test flight this month. After a flawless launch in December 1979, Mission LO-1 concluded without a hitch. For the ESA, which was barely four and a half years old, this was quite an achievement.

Mission LO-2, the first launch to carry satellites in lieu of ballast, didn't go as well. On May 23, 1980, known as Black Friday to amateur satellite enthusiasts, an experiment called Firewheel, and a hamsat, Phase 3A, became casualties of ESA and Arianespace's first launch failure.

Three years later on June 16, 1983, Ariane statistics rose from three successes for five attempts to four for six. A new European satellite, ECS-1, and OSCAR 10 were safely in orbit.

Although OSCAR 10 is the most powerful and highest hamsat, it didn't achieve the desired orbit, nor did it escape unscathed from the upper stage of the launch vehicle. After being bumped or incorrectly released from the SYLDA (dual satellite deployment canister), the satellite was left in the wrong orientation with respect to the sun and spinning in the opposite direction the onboard computer expected. Due to the poor sun angle, some parts of the satellite were dangerously cold and there was little available power.

The spin direction was not corrected, since it was easier to adjust the software.

When it was time to fire the motors to correct perigee and inclination, all of the fuel escaped in one long burst during th perigee burn. The problem was later traced to a drawing error in the AMSAT-built liquid ignition unit. The end result was an orbit with a low inclination and a very high perigee. This meant users in the northern hemisphere received 60% less operating time than originally planned. The spacecraft also spends more time in the hostile Van Allen radiation belt.

When Phase 3C is launched, we hope for a smoother ride. Mission V22 will be the first to use an Ariane 4 vehicle. This test or qualification flight will also carry ESA's Meteosat P2 weather satellite and the U.S. PANAMSAT communications satellite.

There are six possible variations on the Ariane 4 design to allow each launcher to be tailored to the payload requirements. The simplest configuration can lift 4200 pounds to geostationary transfer orbit, while the most complex version, with four external liquid-fueled, strap-on boosters, can lift nearly 9300 pounds to the same orbit. By comparison, Ariane 1, which took OSCAR 10 into space, was rated for 3750 pounds. Ariane 4 carries fifty percent more liquid propellant in the first stage than Ariane 3 and sports a new multiple satellite fairing (container) for heavy geostationary payloads. The second and third-stage engines are unchanged from the Ariane 2 and 3 launchers.

Insurance

AMSAT NA (North America) and AMSAT DL (West Germany) are working together to purchase launch insurance for Phase 3C. The goal for AMSAT NA is $10,000. As part of the launch campaign, the insurance would cover the loss of the spacecraft if the worst should occur.

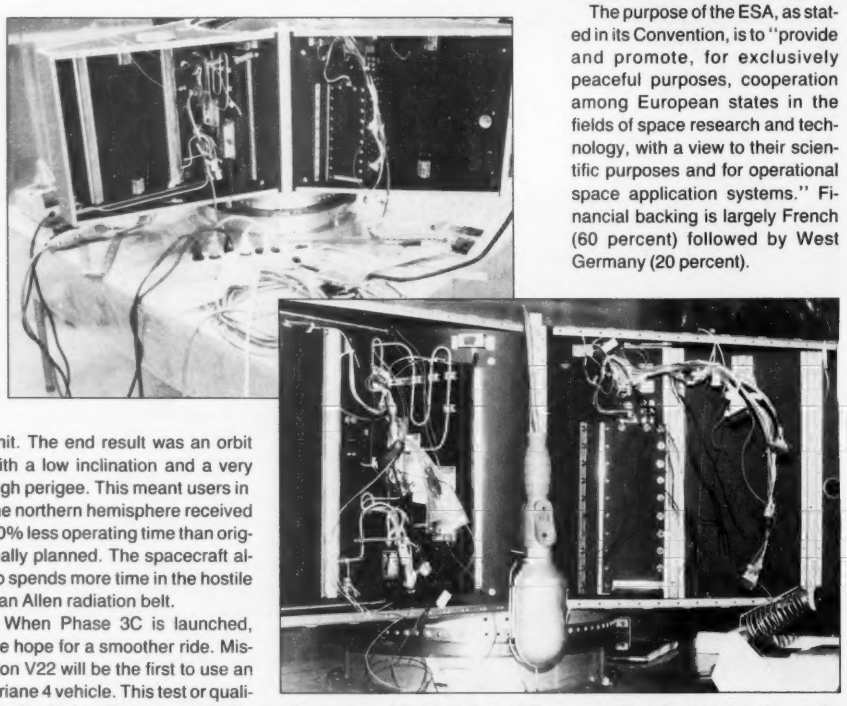
Donations of $10.00 or more to the insurance fund will be acknowledged with a special Phase 3C QSL card and recognition in ASR, the Amateur Satellite Report. Donations of $30.00 or more will bring an AMSAT certificate showing the donor's name and callsign over an image of a Phase 3 spacecraft. Further perks are offered for amounts of $100 and $1,000. AMSAT is a non-profit, scientific, educational corporation and is treated as a charitable organization for tax purposes. Inquiries or donations should be sent to Phase 3C Insurance Fund, AMSAT, PO Box 27, Washington, DC 20044.

European Rockets

With so much attention on the Soviet space station, Mir, or studying shuttle recovery efforts and our own plans for the 1990s, we discount or ignore the efforts of others dealing in the business of space. Among the newer contenders, Europe leads the way with a serious cost-effective program.

The European Space Agency was created in 1975 to consolidate the resources and activities of the European Launcher Development Organization and the European Space Research Organization. Member countries are: Belgium, Denmark, France, Ireland, Italy, Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and West Germany.

The purpose of the ESA, as stated in its Convention, is to "provide and promote, for exclusively peaceful purposes, cooperation among European states in the fields of space research and technology, with a view to their scientific purposes and for operational space application systems." Financial backing is largely French (60 percent) followed by West Germany (20 percent).



Photos A and B. The Phase 3C spacecraft under construction at the AMSAT lab in Boulder, Colorado.

Ariane rockets are launched from the Guiana Space Center near Kourou, French Guiana, just north of Brazil. The center is on nearly 400 square miles along 37 miles of Atlantic coast at the equator. This location uses the earth's spin to give Ariane launchers a 17 percent payload advantage over operations from the Kennedy Space Center. Also, it's easier to achieve a geostationary transfer orbit when a rocket is launched from the equator. Launches from the Kennedy Space Center must go through complicated maneuvers to achieve the correct trajectory. With two pads in operation, the Guiana Space Center can launch up to 11 missions per year. The tentative schedule calls for ten for 1988.

The ESA and its commercial launch service operations company, Arianespace, appear to be only in the satellite launching business.

The ESA Ministerial Council was due to have a summit meeting in November. Depending on the results of this conference, the future funding and ambitions of Europe's space program may be expanded. Projects waiting for the green light are: the Ariane 5 launch vehicle; the Hermes manned mini shuttle; and the Columbus orbiting lab, designed to interface with the U. S. shuttle program. These endeavors are not cheap. The estimate of more than 12 billion U.S. dollars over the next ten years is likely to be low. Cooperation between the

Ariane Launcher

Type	Length (feet)	Payload to GTO (pounds)
Ariane 1	154	3750
Ariane 2	161	4300
Ariane 3	161	5700
Ariane 4	192	4200–9300(*)

Table 1. Overall launcher length and vehicle lifting capabilities to GTO (Geostationary Transfer Orbit).
** Depends on strap-on booster configuration.*

"Phase 3C waits among those future satellites for the chance to become an OSCAR."

The Ariane system is a three-stage vehicle based on known and proven technology. The Ariane 1 was designed in six years at a cost of 1.2 billion dollars. It stands 154 feet tall, is 12.5 feet in diameter, and weighs nearly 230 tons on the launch pad. All three stages use liquid propellant. The first two have a mixture of UDMH (Unsymmetrical DiMethyl Hydrazine) for fuel and nitrogen tetroxide as the oxidizer. The third stage uses liquid hydrogen and oxygen. This was the first cryogenic engine designed in Europe, but is was based on existing expertise from Germany and France.

ember countries is essential, or the 13-member consortium may end up as a French-German operation.

Where does the amateur radio satellite program fit into this picture? In addition to Phase 3C, already scheduled and waiting for launch, the German Phase 3D project and AMSAT NA's Phase 4 geostationary satellite program both depend on the Ariane vehicle. These projects are currently proposing to modify the adapter ring between the launch vehicle and one of the main satellite payloads to accommodate a hamsat. If this is acceptable, the active amateur satellite would be about three feet high, ten feet in diameter, and weigh nearly 900 pounds. Studies and designs have already begun on both projects. The future has incredible possibilities.

Satellite Updates

AMSAT-OSCAR-10 may not be back in operation until the first of December, but as of this writing, we still hope for activity in November. The ground-control stations around the world will assess the situation carefully before allowing even guarded transponder operation.

Fuji–OSCAR–12 enthusiasts were surprised in mid-September when the satellite did not show up in the correct mode. In fact it was off! The previous operating schedule was just too ambitious and overloaded the battery. Later in the month, all was back to normal. The new schedule includes plenty of mode JA and JD activity. While the analog transponder mode is usually on for two continuous days when it is activated, the rules for the digital system continue with a two-hour on/off cycle during a single day of activity. Sufficient recharge time has been allowed to avoid the problems of September. Check the AMSAT nets and publications for updates.

RS-10/11 continues to do well, but an operating schedule is still not known. After two months of continuous KA mode on RS-10, from August through early October, many would like to try more T- mode activity on RS-11.

I have received several calls and letters from you with questions about small antennas for RS chasing. The October Hamsats column gave several potential operators the needed push to try out mobile satellite activity, or to listen for the new satellite pair on simple antennas. Apartment dwellers and others with stringent deed restrictions have found that with reasonable receiver gain, indoor or attic-mounted antennas can work very well. Bob WA5PCD has made ROBOT contacts with RS-10 using a dipole for ten meters and a Ringo (no Ranger) on two meters. The uplink power was 12 watts, the antennas were in the attic, and the receiver was a Drake 2B with no preamp. Bob admits that a preamp would help, but for now he is at least on the air. Come on up and check the activity on these hamsats. New countries and new operators seem to show up every day.

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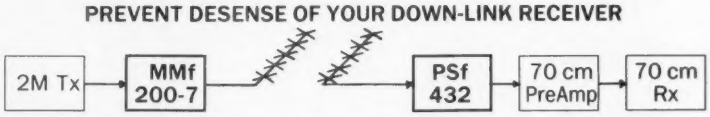

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Loss @ 435 MHz	40 dB min	Loss @ 145 MHz	70 dB typ

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D-52	10/15/20/40/80	2	105'	69.95
D-56	10/15/20/40/80	6	82'	114.95
D-68	10/15/20/40/80/160	8	146'	149.95

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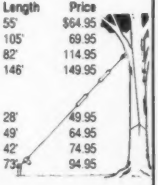
VS-53	10/15/20/40/80	3	42'	74.95
VS-64	10/15/20/40/80/160	4	73'	94.95



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*Feedline can be buried if desired

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D-15	15	22'	18.95
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D-40	40	66'	22.95
D-80	80/75	130'	25.95
D-160	160	260'	34.95

Includes assembly instructions, Deluxe center connector, 14ga Stranded CopperWeld Antenna wire and End insulators.

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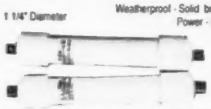

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GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U. S. S. R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

HF conditions for DX are a mixed bag this month. In general, HF DX always suffers at the solstices, especially in the winter when days are short and nights are long in the northern hemisphere.

Look for an active-to-disturbed geomagnetic field around the first of the month, and again about the 10th, the 20th and 30th. Be aware of some possibilities of much larger disturbances between the 19th and 23rd, when geologic disturbances may be expected as well as geomagnetic ones. When the earth's magnetic field is active, HF paths near the poles are very uncertain, and often impossible. However, trans-equatorial paths can be quite useful. These disturbances can take place within a few days before or after the predicted days. The chart will assist you in picking the days which ought to be Good (G), Fair (F), or (P) Poor. A January preview: look for very disturbed conditions between the 6th and 9th.

DECEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
		1 P	2 F	3 G	4 G	5 G
6 G	7 F-G	8 G-F	9 F-G	10 G	11 G	12 G
13 G	14 G	15 G-F	16 F-P	17 P	18 P	19 P
20 P	21 P	22 P	23 P	24 P-F	25 F-P	26 F-G
27 F	28 F-P	29 P	30 P	31 P-F		

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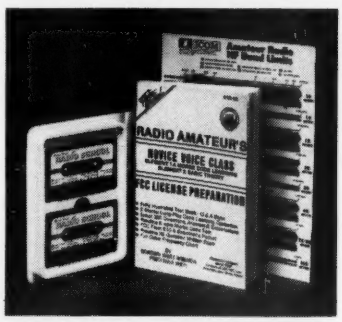

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Shojiki Electronics Corp., 1327K
Niagara St., Niagara Falls, NY 14303. COD's 716-284-2163

CIRCLE 192 ON READER SERVICE CARD

HAM PROFILES

Janette LeBlanc

Tom LeBlanc NX7P
979 Young Street Suite E
Woodburn OR 97071

SHE DID IT

Janette was born on June 15, 1976, in Bakersfield, California, with the umbilical cord wrapped tightly around her neck. We got to see her about two hours later. A specialist was called to observe her. Later, doctors instructed us to do a special range of motion exercises with her and we did these for years. We were very thankful to see Janette grow up to be a normal, healthy girl who can enjoy life and meet interesting challenges.

One of Janette's first challenges was amateur radio. She expressed an interest in the hobby in the third grade. In a special assignment, her teacher instructed the students to do a project with dad. Any project would be fine, as long as it was with their dad. After kicking around some possibilities, Janette decided she wanted to learn the Morse code. When the project was due, she demonstrated to her class how messages can be sent and received through Morse code. Her classmates wrote words on a board hidden from Janette's view. I sent the code, and Janette decoded and told the class what words they had written on the hidden board. She also read a report she had prepared on the history of Morse code. The teacher encouraged her to continue on to get her ham license someday.

Becoming a Novice

About two years later, at age 10, she decided to get her Novice license. She attended a Novice preparation class offered by Clackamas Amateur Radio Club, in Oregon City. She took her test in November of 1986, shortly before the Novice enhancement came.

Janette became KB7AEZ and worked several states on 40 meters. When Novice enhancement came, she made some contacts on 10 meters, but did not work the 220 MHz band. She liked the idea of getting on two meters where more repeaters and autopatch equipment are available. She decided in late June to go for an upgrade. She wondered, "Do you think I can do it?" We worked together off and on from that point. During the last two weeks of July, we picked up the pace. Studying just before bed proved profitable. She read my study sheets during the day and answered questions that I prepared. It was almost like learning a new language.

> ***"Success and accomplishment are good for us all."***

So many things were totally foreign to Janette. At times we felt like giving up. The challenge of this project required hard work from both of us. During the last week before the exam, I took two afternoons off work and we studied together at the library. Breaks were fun, as was dinner out together those two nights. Those were fun times for both of us, since we spent time together and got to know each other a little better.

The first of August came, and she was ready but very nervous. We went to Portland Community College for the test. On the way to the test, I told her several times that the volunteer examiners are her friends. I encouraged her to ask questions if she did not understand any instructions. I tried to help her to understand that the VEs are on her side, because they want to see more young hams. After the test, we sat in tense anticipation as the examiners graded it. A VE looked up at me and held up one finger. I wondered if he meant that she missed it by one point. He said, "No, she only missed one question!" She passed with a 96% score. While she waited for her temporary papers, I presented her with a micro handheld, carefully fitted with a bow on its battery pack. She was embarrassed, proud and relieved, all at the same time.

She did it! Success and accomplishment are good for us all. When we succeed in one thing, it transfers to other areas of our lives, making it easier to succeed. Our Incentive Licensing Program offers several levels of challenges and opportunities for success.

Janette monitors the Mt. Hood repeater, and we often talk on simplex to sharpen up her operating skills. We use our handhelds to keep in touch when my XYL Karen and I are away from home. On one occasion, I went deep sea fishing with my dad. Janette maintained contact with us through the coastal repeaters, while she and the rest of the family went shopping. Ham radio was especially helpful that day because the fishing boat was unexpectedly delayed (three hours) coming back to port. This information gave the family more flexibility in shopping and sight-seeing. They knew exactly when to pick us up at the dock.

A Special Accomplishment

A couple of humorous things came up in the early stages of Janette's technician preparation. When I explained about simplex operation, she seemed satisfied that that was pretty simple to understand. After I explained the use of split input-output frequency separation in repeater operation, she guessed, "That's called complex right?" I said, "No, duplex." When we first discussed the ionosphere, I told her that is where there are a lot of free ions and electrons. Janette responded, "You mean Free-ons?". Helping my daughter into ham radio has been a very enjoyable and memorable experience. Neither of us will ever forget the hard work, the feeling of accomplishment or the joy of doing something special together.

I have heard several people say that we need younger hams. Well, the Novice Enhancement will certainly help to make this possible. The new Technician-General split test makes the Technician test a lot easier than it used to be. This will encourage more people to upgrade. Even young people with no background in electronics can grasp the concepts with some help. Concepts can be rephrased into more understandable vocabulary. Various quick-learning tricks can be used in other places. Young people are smart. If we encourage them and help them, perhaps we will realize our goal of adding more young hams to our ranks. 73

Tom LeBlanc NX7P lives in Oregon with his XYL and three children. He has just completed a licensing study guide for radiotelephone operators.

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RTTY LOOP

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RTTY CHEER

The end of the year is a funny time. With various giftgiving opportunities, the urge to shop is upon us. With the end of the calendar year, the urge to clean up loose ends is here. And with a new year about to dawn, one always hopes to get a glimpse of something new. This month, I think RTTY Loop will satisfy all!

Queries

Dennis Roy, of Detroit, Michigan, writes that he has been a longtime short wave listener, who does not own "any fancy equipment, just an old Hallicrafters S-38C." He is curious about monitoring press and other commercial RTTY signals, and asks the universal questions:

(1) What is the cheapest equipment available to monitor commercial RTTY, including the cheapest receiver, terminal unit, and computer?

(2) What is the best equipment available?

(3) Are there any decent world news services to monitor? Are some of them scrambled and, if so, should I just give up on the idea?

(4) What is a good reference manual for frequencies to monitor?

First off, any receiver stable enough to receive single sideband is, in general, stable enough for RTTY. Extra money does buy some nice features, such as filters that can strip off an offending CW signal or digital readout. These, however, aren't really necessary.

What kind of money are we talking about? You can buy a new serviceable receiver for a couple of hundred dollars or spend some time at a local hamfest and spend a whole lot less. Go with a knowledgeable amateur. There are gems among the rubble at hamfests. What you will be looking for is a stable, general-coverage receiver with easy frequency readout and adjustable BFO. I can't think of a hamfest I've ever been at where there haven't been a few receivers that would fill the bill. Lacking a 'fest, you might check the used equipment shelves at a local ham store. The price might be a tad higher, but you won't feel as rushed to buy as at a flea market. Still no? Find a local ham, through him or her a local club, and make your needs known. You never know who has a boat anchor lying in the basement.

The cheapest terminal unit? There are none! You mentioned computers—there are programs for several of them which decode RTTY audio directly. They're not as facile as a dedicated piece of hardware, but they're cheaper.

If you insist on hardware use simple little one-chip demodulators. This is just another name for terminal units, which can be built for a few dollars. See back issues of RTTY Loop for details.

The best? If I have to blue-sky it, I have a spec sheet on a RTTY demodulator here that would knock your socks off, and there is this receiver that will drag signals up out of the mud like a new detergent. The important thing to remember, however, is this: If you can hear them, you can copy them with most any RTTY setup. If used as a terminal, the computer type is irrelevant, anyway, save for the communications program that runs on it. The software features is the salient point here.

I've seen lots of books on press frequencies, and reviewed or commented on them in the column. My main approach, however, is to scan the 8 MHz to 15 MHz frequencies slowly, and look for copiable signals. Sometimes it's English, sometimes Spanish or Italian, and occasionally a language I can't directly identify. But that's the best way to know what you can hear, from where you are, with what you're listening on.

What's New in RTTY Gear

One tradition of RTTY Loop's December edition has been a look at current items of interest to RTTYers. I want to stress that I derive the information presented in this segment of the column, unlike my usual material, from ads, not equipment. You are on your own—let me know what happens!

Kenwood features the TS-440S HF transceiver, complete with a FSK mode, although it is called "AFSK" in the ad. Even with the statement "AMTOR compatible", it sounds like they're talking to us.

There are various interfaces in the Barry Electronics Corporation's ad. It looks like they have a selection of Kantronics, Microlog, MFJ, and AEA equipment on hand. Nothing much detailed, just all kinds of alphabet soup. QSL?

Another ham dealer featuring AEA, MFJ, and Kantronics is Northeast Electronics Supply Company, Inc. There is again only sparse details, but worth a shot.

AEA's PK-232, an item which has had more than a passing notice in this column, is prominent in our tour. With new programs said to display FAX on Commodore and IBM-compatible screens directly, this bears another look.

More complete lines, including some HAL equipment, is featured in the EGE, Inc. ad. They seem to have nearly everything.

Hamtronics has an interesting little board in its ad for an FSK data modulator and demodulator board. They sell for under forty bucks a piece, for up to 1200 bauds. With "202" in the model number, I wonder what standard they follow?

Michigan Radio is another purveyor of fine goods, including AEA, Kantronics, and MFJ. Maybe you should use carbon paper for the postcards?

GLB Electronics features a portable packet controller. Sitting next to a nine-volt battery, the battery looks big! Low-current drain and standard features make this package look very attractive.

A communications program for IBM PC compatibles is described by ExpertQ. Supporting many Kenwood transceivers, most multi-mode terminal units, and PC-type computers.

FAXers please note the ad placed by Elmer Schwittek K2LAF for an updated FAX receive program for IBM PC compatibles. Dan Diehlman AE6G offers yet another full-featured IBM PC type communications program.

RTTYers, be sure to check out Austin Amateur Radio Supply. They carry what by now is a familiar assortment of RTTY items. Another Texas dealer to investigate is Madison Electronics Supply. They have a RTTY line that is becoming a "standard" today.

Finally, there is the Brapper Box. Here is a device to couple atransceiver to a TNC. Why? Because some modern transceivers have more than mike and PTT on their mike connectors, and interfacing them can be a nightmare. I've yet to do it myself! Drop Electron Processing, Inc., a note about this unit.

I encourage you to look for the ads in the October, 1987, issue of *73 Magazine* for pictures and additional information. When writing to any of these folks for information (or even to order!), be sure to tell them you saw them mentioned here, in *73*'s RTTY Loop.

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Woodbridge VA 22191

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Hilton NY 14468-9535

Michigan Radio
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Mt. Clemens MI 48405

GLB Electronics, Inc.
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Buffalo NY 14224

ExpertQ
10245 Leatherwood
Fort Worth TX 76108

Elmer W. Schwittek K2LAF
429 N. Country Club Drive
Atlantis FL 33462

Dan Diehlman AE6G
5748 N. Bond
Dept. 73 (RL)
Fresno CA 93710

Austin Amateur Radio
Supply
5325 N. IH 35
Austin TX 78723

Madison Electronics Supply
3621 Fannin
Houston TX 77004

Electron Processing
Incorporated
P.O. Box 708
Medford NY 11763

Loose Bits

In the loose ends department, a few notes. In the October '87 edition of RTTY Loop, I relayed a large list of FAX stations for those interested. The call sign of the seventh station, however, is not printed. I assume a glitch in data transmission between here and *73* HQ is responsible. We transfer this column electronically! The line should read:

KVM70 HONOLULU, HI, USA
9982.5, 11090, 16135, 23331.5

Also missing is proper credit for the source of this list. My flying fingers forgot to type the name of Wally Vance, KW5N, of Meridian, Mississippi, as the originator of this massive work. Thanks, Wally, for passing it along.

Here's my promised peek at next month. One of the all time most popular columns was the RTTY program for the TRS-80® Color Computer presented in the July 1987 column. January's column should go one better with another program for the CoCo that includes many, if not all, of the features you have been asking for.

In the meantime, I remain as accessible as ever, via mail, at the above address, CompuServe (ppn 75036,2501), or Delphi (username MARCWA3AJR). Remember to enclose a stamped, self addressed envelope if you wish a return response by mail. The complete index to RTTY Loop is still available, detailing over ten years of this column. Just send a SASE with postage for two ounces to the above address, and I'll be happy to send one to you. In the meantime, all the best for a wonderful holiday season to each and every reader of RTTY Loop! 73

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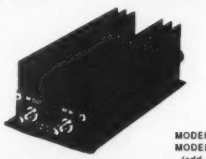

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OP-ED

by Larry Ledlow, Editor-in-Chief

Small is Beautiful

I know the story all too well. I've been there. You've come back from the East-West FM ATV DX Society Region 4 Hamvention about $1500 lighter than when you left. You've just bought the latest Q-Radio Model BFD-4000XS pico-sized, 10-band handie. In your hurry to get home and charge the selenium-thorium battery pack—you *knew* you should have bought the car roof solar power unit—you got two speed warnings and a ticket for going through a red light. And by the way, you forgot to close the car door and turn out the headlights when you ran into the house. Boy, oh, boy, you just can't wait to fire that little beast up and rap with the guys on the local repeater. Well, at least you *think* there's a local repeater on 10 GHz.

You scatter the box, wrappings, and radio instruction manual in the wind. You don't notice the cat bat the crumpled sales receipt under the refrigerator. You absolutely *must* show this new rig to your better (and perhaps more rational) half. This is called the retail sales chain game. The salesman sold it to you (or did you sell it to yourself?), and now you have to sell it to someone else. After all, this little radio has come to share your household. It will add enormous dimension to your hamming lifestyle, and it's only right to properly introduce it to your other loved ones: the HF rig, the computer, and your XYL. But where is she? Ah, that's right. She said she'd be home late from closing a multi-national merger deal. Then you'll *both* have something to celebrate.

Alone in the Dark

Make sure you don't lose track of the real priorities, though. The first order of business is to charge the batteries. Now, where did that manual go? Oh, never mind. You'll just use the optional, drop-in quick charger. That should only take about a minute. Who needs the manual for charging, anyway? You drop the rig in, turn the charge rate knob to the MAX position, and flip the switch. ZAP! Your house lights go out. So you fumble around groping for that flashlight you bought a couple of years ago. Ouch! Wrong drawer. You wonder if you're bleeding much. Ah hah! Got it! You fill with disappointment at the flip of the flashlight switch. Dead D-cells. Nothing worse than dead D-cells. Blasted ancient technology! Suddenly, you blind yourself with a flash of brilliance. You can use the car headlights to illuminate the garage and find the circuit breaker box. Then you sigh when you see the headlights and dome lamp glowing in death like embers in the moonless night. Borrow a flashlight from the neighbors? Nah, it's a half-mile walk. After all, you bought this hilltop house in the country to get away from neighbors. You have to be self-reliant in the country. No, the rain isn't a problem. You could walk a mile in the rain if you wanted.

You really only take half an hour to restore power. All those antennas in the garage make the breaker box pretty hard to find in the dark. Look in the mirror. All those scratches on your face from extruded aluminum make you look like you cut yourself shaving. That's what you can tell everyone at work tomorrow. Except you don't shave your forehead. Ah, well, never mind. The Model BFD-4000XS beckons your attention.

You inspect the drop-in charger, and it looks unscathed. Take a real close look at the battery pack. Funny how the rig looks two-toned now with a dark brown battery pack. You don't *think* it was that way when you bought it. Oh, well, it's probably covered by the warranty, right? Just slip those batteries off and replace it with the extra heavy duty power pack. Heat sink? Nah, no need to screw that on. You just want to try the radio out for a few minutes. There you go. No muss, no fuss. The full-charge ready light comes on in 48.273 seconds, according to the nifty, multifunction, LCD VOM-timer on the charger.

Now You're Cookin'

Great! You're in business now. Get out the repeater directory and start loading up some of the 4096 memories. Isn't that pico-sized HT just amazing. It's got more memory cells than the average domesticated goldfish. At least that's what the ad said. OK, OK. So the League doesn't list a 10 GHz repeater in your state. That's probably because most repeaters in that band are "uncoordinated." No problem. Just put the handie in scan, and go make yourself a cup of coffee. After five minutes of scanning you still haven't heard any signals. No problem. Just pop down to 2300 MHz and listen. In a few seconds the rig's voice synthesizer announces, "Signal detected! Awaiting command!" "Receive," you order. Hey! This could be fun! The squelch breaks open, and you hear a funny tone. Hmmmm. All these years of synthesized rigs, and they still haven't fixed all the intermodulation problems. Forget 2300 MHz. You head for two meters instead.

The rig scans, and the squelch opens again on what must be a local repeater. You request a signal report. A voice comes back in a funny language. Probably a little tropospheric ducting. Check that frequency again. Hey, wait a minute! You've just transmitted out of band. You still don't know you just had a brief chat with a Soviet cosmonaut. And you gave your callsign, too! Maybe you won't get a pink slip.

You hear a car in the driveway. Now's your chance to justify the little radio's existence in your household. Quick! Tune to a repeater you *know* is active. You key the mike at the moment your wife steps inside. You *must* show her how happy this little radio makes you. And then you notice a small puff of smoke from the back of the rig. The display winks twice and disappears. Keep smiling! "Hi, honey," she says with open arms. "Did I have a rough day closing that deal." Keep smiling! That smell? Oh, nothing. You just burned some coffee on the stove, right? Keep smiling! Then show her the rig. Ta dah! Doesn't she think it's beautiful? "I think it's cute," she says, and you flinch. Cute? It's a *beautiful* piece of engineering. "Whatever you say, dear. As long as you're happy with it." Mission accomplished! She's accepted it, and you breathe a sigh of relief. Now what happened to that sales receipt?

ENDS AND ODDS

Special Thanks:

KT2B deserves a big hand for his contributions to this issue. Keep up the good work.

Correction:

Everyman's Microwave Amp (KT2B), *73* October: Figure 1—For power supply, use 3-wire AC connection instead of 2, and ground the chassis for safety. Fuse and AC power switch should be in the same leg (not in opposite legs) and should switch the hot side of the AC line. Also, in the schematic of the 23cm cavity amp plate current will be easier to read if the milliammeter is inserted in series with the HV line.

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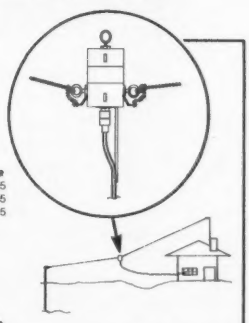
RAG-D15	15	22'	$35.95
RAG-D10	10	13'	$35.95



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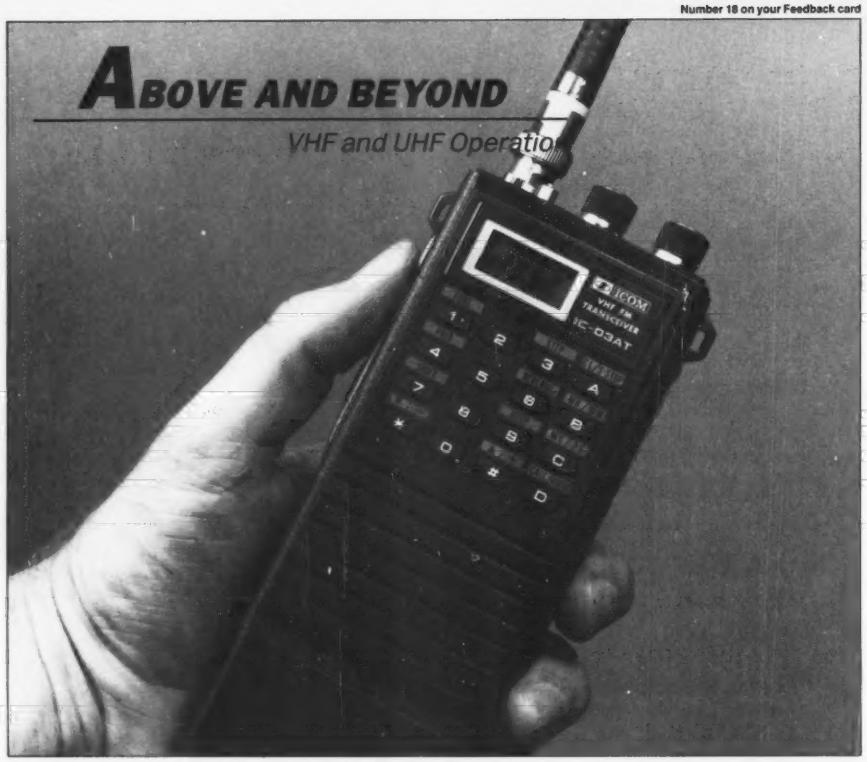

The ICOM 03AT handheld.

Pete Putman KT2B
3335 Fieldstone Dr.
Doylestown PA 18901

A LITTLE HT HISTORY

This month's column deals with the world of hand-held radios. I've chosen the IC-03AT as a typical example for two reasons: It covers 220 MHz, a band very much in the news recently, and it's made by a company that produces more models of handhelds than anyone else in the world.

Let's look back 10 years at the state of hand-held radios. You could choose from three or four cumbersome, crystal-controlled, battery-hungry models. There were also some hybrid portables, such as the Drake TR-22 and TR-33. A combination base/mobile from Wilson Electronics with a 10- or 3-watt power option was also popular. All of these units operated FM in the 144–148 MHz range.

The majority of 2m FM users then did not use handhelds. Most preferred base or mobile radios with 20–30 watts output. My first 2m FM transceiver was a Genave GTX-10, running 10 watts output on 10 crystal-controlled channels, which I bought in December, 1975. At the time, Genave also made a cute 3-channel 2- watt handheld intended for the commercial market, but it was adaptable to ham needs.

Several events revolutionized the hand-held market in the late '70s. First, the FCC deregulated repeaters, making them considerably easier and cheaper to install. Then, the FCC designated a second repeater sub-band in the 145.100–145.500 MHz region, further encouraging the repeater explosion. Finally, Wilson Electronics introduced the now-immortal MKII and MKIV handhelds. Although crystal-controlled, they were extremely small and offered quick-change battery cases.

Now we had no excuse to buy a handheld! My bank account was $250 lighter after buying my first MKII in mid-1978, and others followed suit. Around the country thousands of MKII and MKIV (4-watt version) transceivers came on the airwaves. Repeaters abounded! Hams took their handhelds everywhere, operating from skyscrapers, boats, cars, mountaintops, and even commercial airline flights. The latter operation resulted in a flurry of incidents that led to serious restrictions on HT operation aboard airliners.

The next step up was the synthesized HT. Henry Radio dropped the Tempo S-1 synthesized 2-meter handheld on the market, followed closely by the Yaesu FT-207R. Hamdom reacted predictably. The demonstrator FT-207 disappeared from the booth at Dayton (despite being secured with a chain) and all dealer units sold out quickly on Friday morning. Now, you "weren't anybody" unless you had the latest handheld!

"Hams took their handhelds everywhere . . . skyscrapers, boats, cars, and even commercial airline flights."

The next handheld then turned out to be the ICOM IC-2AT, followed closely by the Kenwood TR-2400. "No fair!" cried the hordes. Hundreds of hams rushed out to put the latest synthesized radios in their shack, delegating piles of old Wilsons, Motorolas, Genaves, and newer MKII radios to flea market tables. Others put them up for sale in the Yellow Sheets, and some were donated to clubs and local civil defense organizations.

The Humble HT

The point of all of this? HTs have come a long way in a short time. Virtually unknown 10 years ago, the ubiquitous handheld is taken largely for granted nowadays. You'll find them everywhere—in gloveboxes, atop the fridge, in purses, backpacks, you name it. Handhelds are made for 144, 220, 440, and 1260 MHz—even 10 and 15 meters! Accessories abound with docking boosters, chargers, custom battery packs, external amplifiers, antennas, VOX headsets and speaker/mikes in plentiful supply.

Unlike most equipment, the hand-held transceiver tends to be an impulse purchase. How many amateurs have you known who arrived at the latest hamfest with $300 burning a hole in their pocket, looking to buy a new toy? With FM operation as popular as it is worldwide, look for more significant advances in hand-held technology, such as multi-band radios (already a fact with the FT-727, reviewed in this issue) and perhaps even multi-mode radios. In fact, Santec made an SSB/FM 2-meter portable for a short while but it was pulled from the market.

How about multi-mode handhelds for 6, 220, and 432? With the continuing evolution of the OSCAR, FUJI and RS satellites, a handheld with a simple turnstile antenna might soon be all you need for worldwide communications. Can't wait? Then get one of the remote base station controllers and work everything from your HT. This is a feasible solution for amateurs who live in areas with antenna restrictions and severe TVI problems. Simply locate the station atop a nearby building or mountain and link up on VHF/UHF.

Where would public service be without handhelds? The evolution of portable packet stations has radically changed traffic handling. Many times the only communications available from a remote location have been through a handheld. Think about all of the forest

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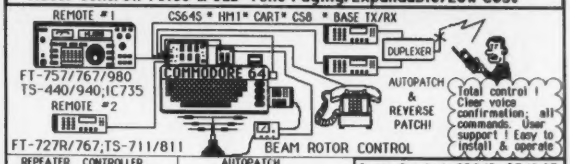

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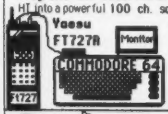

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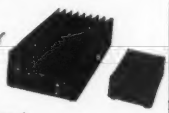

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fires, floods, hurricanes, tornadoes and other natural disasters you've read about...handhelds were surely in use each and every time. On a lighter note, imagine keeping in touch with your buddies at Dayton without a handheld. Unthinkable, right?

Trials and Tribs of HT Use

We've come to depend very heavily on hand-held transceivers...even to the point where they are used in totally inappropriate applications. Consider that same impulse buyer who has just picked up a brand-new FB-HTX1234. After using it around the house and at nearby hamfests for a month or so, he decides to try it from the car. Hmmm, not so good. That little rubber duck antenna doesn't hack it. Better get an external whip, preferably a ⅝ wavelength loaded model for some gain.

Now he hears the repeater much better, but for some strange reason, it can't hear him all that well. "Why is that?" our ham muses: "I've got a gain antenna, and the repeater is full-quieting. Doesn't make sense!". Well, it does make sense if you stop and think about the fact that (1) the repeater is likely running more than 100 watts, (2) using a gain antenna array, and (3) sited in a favorable location. Of course you'll hear the repeater's signal better than it will hear you! So, our HT-mobile fan goes to his nearby dealer to purchase a 25-watt solid-state brick to give his signal that needed boost. A preamp on receive would be handy, too.

Now the repeater hears him fine. He hears it fine, too—as well as all kinds of intermodulation products like paging services, taxi dispatchers, even the local FM radio station! Not only that, it's a real pain having to drive with one hand while holding the HT near his ear to hear above the ambient car noise. The speaker mike he bought doesn't help either, since he must hold that near his ear, also. The HT slides all over the seat, and the coax from the antenna jack to the amplifier keeps coming out of the BNC connector.

Argghhh! After a few near-collisions with another car while wrestling with the whole mess, he gets disgusted and trades everything in for a 25-watt mobile radio...with a helical resonator in the front end, built-in power module, 3-watt audio amplifier, easy-to-read display, large tuning knob, GaAsFET front end, and PTT microphone. Well, this scenario is played out every month all over this country as a continuing wave of first-time hand-held buyers try to get 25 gallons out of a 5-gallon container. It can't be done.

Remember that the front-end design of most handhelds is mediocre at best, and you're making a bad situation worse by putting a gain antenna and preamplifier in front of them.

By worse, I mean in terms of selectivity, not sensitivity. And selectivity is accomplished by means of filtering, which translates into a certain physical size for a given filter—size that just isn't available in the average hand-held transceiver. The well-designed mobile transceiver will typically offer dual-conversion, employing two or more stages of filtering. Such a design might employ four to six poles at the first IF and two to four poles at the second IF. Such a radio will also employ gain stages in a configuration that offers wide dynamic range to avoid spurious and intermodulation products.

"Virtually unknown 10 years ago, the ubiquitous handheld is taken largely for granted nowadays."

This isn't to say that you shouldn't buy a hand-held radio—far from it! You'd look silly with a mobile rig strapped to your belt at a hamfest and it would take a toll on your battery packs! An HT is often a very valuable piece of equipment both in and out of the shack. Just don't expect unreasonable things from your handheld in terms of performance, because it just can't deliver most of the time! (And for gosh sakes, if I see another HT-mobile type careening down the interstate with a VOX headset falling over his face, driving with one hand and trying to retrieve the handheld from under the back seat...well, enough said.)

What's New in HTs

Kenwood finally got their act in gear with a full line of 220-MHz equipment for Novices. ICOM took a bold step by gambling on the outcome of Novice Enhancement with regard to 220-MHz base and mobile operations, and so took first place with a complete line of radios, among them the aforementioned IC-03AT and IC-3AT. Now Kenwood has rushed into the fray with a 220-MHz version of the TH-215 transceiver, adding a compact TM-321A for mobile work, to boot. Think the folks in JA land are excited about enhanced Novice privileges? You bet. How long will it be before we see an American-made 220 MHz handheld? How about it, Ten-Tec?

VARIA

Yaesu has stolen a march on everbody by introducing the FT-736R, upgrading the popular FT-726R with full VHF/UHF coverage from 50 through 1296 MHz. We'll have a review of it in the next few months (in between everything else), preferably after using it during a major contest such as the January VHF Sweepstakes. Couple this with the FT-767 design, and you can see where the future lies: A multi-band, HF/VHF/UHF superstation covering everything from 1.8 MHz to 1296 MHz on transmit, offering general coverage receive within that same range. The price? Probably around $2,000. Might be worth it to have everything in one package, though.

Hamarama '87

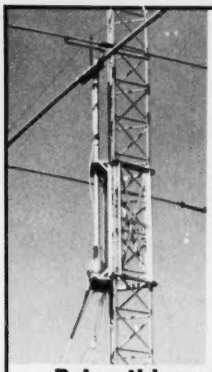
Once again, October has come and gone as you read this, and that means we've had another running of the PackRats Hamarama, organized and supervised by the Mt. Airy VHF Radio Club of Pennsylvania. This year's event spanned two days: There were seminars and presentations on Saturday, October 10, and the famous flea market on Sunday. The Mt. Airy Club has been around for over 30 years, and has sponsored this weekend for quite a while. Some of you readers will recognize the club name from its continued domination of the Unlimited class in the January Sweepstakes. In fact, they have won this category every year for over 25 years! (Kind of like the old New York Yankees... everybody keeps yelling: "break 'em up!")

The dedication of these folks to promote VHF/UHF activity and advance the state of the art is evident not only in their contest scores, but in the series of activity nets they regularly run every Monday evening on 50 through 1296 MHz, featuring check-ins from all over the Atlantic Coast region, inland states, and even Canada. Their newsletter is a first-class effort, mailed monthly to several hundred people. Members reside in all call areas and include some pretty famous names in VHF/UHF operations.

The icing on the cake is, of course, the Hamarama. This year's run featured presentations on portable and mountaintop contesting by John Lindholm W1XX, UHF and SHF preamplifiers by Joe Reisert W1JR, amplifiers for 3.5 and 5.7 GHz by Dave Mascaro WA3JUF and Ron Whitsel, and a panel discussion regarding the adoption of a 50-MHz DX Window. Yours Truly participated in this event, along with three other amateur radio columnists: Joe Reisert, Steve Katz, and Bill Tynan. I'll have a full report on this panel in next month's issue, and all 6-meter enthusiasts should take note! The impetus for this discussion were the chaotic conditions experienced during the intense Es openings of the 1987 June VHF QSO Party, where many stations from England, Portugal and Norway couldn't break through the QRM on 50.110 MHz to make stateside contacts.

The proposal is to set aside the segment from 50.100 to 50.125 as a DX Window during all VHF contests. This would ensure that many of these DX stations (most of whom are limited to 100 watts ERP!) would have a chance to be heard and worked by US and Canadian stations. The problem will only get worse as the next sunspot cycle ascends, which officially began in September of last year. Enhanced propagation via both Es and F2 layers will result in general bedlam on six meters—unless something is done about it now. Keep in mind that whatever action taken, such as forbidding stateside-to-stateside contacts inside the window during the major contests, is likely to be in the form of a gentlemen's agreement.

See you next month with the Best and Worst of 1987! 73



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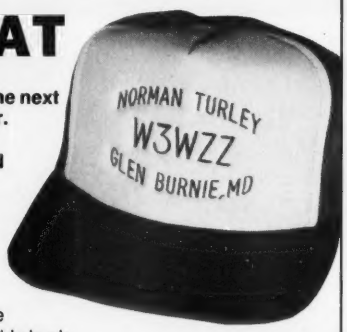

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73 INTERNATIONAL

edited by Richard Phenix

NOTES FROM FN42

And so another year is about to bite the dust, and again amateur radio operators have shown the countries of the world how to talk to each other—but nobody else seemed to be listening. As usual. Let's keep on setting an example, however. Sooner or later somebody will notice. And here's a tip for you if you want some tips about international dealings. A free information packet on the subject is available from QCI International. Write for it, or call: Ms. Cynthia Williams, Dept. 5026, International and Domestic Negotiating Institute, PO Box 882, Red Bluff CA 96080; (916) 529–0246, Extension 5026. (QCI also has offices in Helsinki, Lima, Melbourne, Paris, Sidney, and Vancouver, BC.)

To help set that example, here are the December events you can mention during those DX contacts: National Day—Central African Republic, 1st; Thailand, 5th; Bhutan, 17th. National Holiday—United Arab Emirates, 2nd; Laos, 3rd. It is Independence Day on the 6th for Finland, 7—Ivory Coast, 9—Tanzania, 11—Upper Volta, 12—Kenya, and 16—Bahrain.

Other events: 1—Anniversary Day, Portugal; 5—Discovery Day, Haiti; 10—Human Rights Day in several countries; 13—Republic Day, Malta (and on the 18th for Niger); 15—Statue Day in the Netherlands and Bill of Rights Day, United States; 16—Victory Day, Bangladesh (and on the 23rd for Egypt). On the 25th it is Christmas, Noel, Weihnachtstag 1, Navidad, クリスマス, and جوم عيد الميلاد .

26—Boxing Day, Canada and Great Britain; 27—Constitution Day, North Korea; 28—King's Birthday, Nepal; and 30—Anniversary Day, Madagascar.

ROUNDUP

Licensing information from around the world: *Each month in 1988 you will find right here the latest dope on how to get licensed for operating elsewhere in the world. [Any changes in YOUR country recently? Let me know! —Ed.]*

Here's a timely tip if you're planning a visit to the United Kingdom: A Temporary Operating Permit can be requested by a U.K. licensed operator for a visiting licensed operator to operate under his personal callsign for a period of seven days or less. There is no cost and the permit can be obtained in about a week. The U.K. op should write: The Radio Amateur Licensing Unit, Post Office Headquarters, Chetwynd House, Chesterfield, England S49 1PF.

AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria, Australia

VKØHI

At the time of writing this [September 9, 1987], Dave Shaw VK3DHF (better known to the world DX fraternity as VKØHI) is aboard the Antarctic supply ship, *Nella Dan*, headed for Heard Island. YES! He is going back down to Heard Island for a six-month stint on this rare DX spot.

Dave, who is Electronics Technical Officer with the Bureau of Meteorology, will be the radio officer for this scientific expedition by the Australian National Antarctic Research Expedition (ANARE) to Heard Island. With the anticipated upturn in propagation on the higher frequencies, Dave should be able to satisfy a big demand that still exists for Heard Island.

With what will be a heavy commitment to his ANARE traffic, it will be appreciated if, when he does come on the air, all those amateurs who have Heard Island confirmed will let others make their contacts. Last time, some—I won't call them true DXers—didn't do this although they had up to six contacts in their logs. I feel sure Dave would rather spend what precious time he has for amateur radio giving the little guy a go, instead of pandering to the ego trips of so-called "big guns."

Dave Shaw VK3DHF/VKØHI with Father Noel VK3EVN.

QSLing. This is borne out by Dave's QSLing arrangements. Dave's father, Noel VK3EVN, has taken on the unenviable job of being QSL Manager: Mr. Noel Shaw, 64 Orana Drive, Watsonia, 3087, Victoria, Australia. QSL cards for the operation will be subject to the usual transfer via amateur modes, given propagation, if not, due to poor propagation, a delay until Dave's original logs are landed back into Australia may be necessary—so please do not expect your card via return mail, as Heard Island is one of the remotest places on Earth.

Dave has requested that, for Australian cards, an SASE will suffice, but due to the high cost of overseas postage from Australia, *two IRCs plus a self-addressed envelope* are requested. Personally, I feel this is quite a modest request as it will do no more than cover postage, and none of the cost of the thousands of cards this operation will generate, particularly SWLs via the bureau from one area of Europe.

This approach is a far cry from the few rip-off merchants who now seem to abuse a DX situation within amateur radio.

Operating Frequencies. Dave's preferred mode of operating is to stay away from nets and to operate as an independent operator. He will be on the usual DX frequencies of 80, 40, 20, and 15 meters, plus our Novice section, 21,195 MHz. His antennas will consist of dipoles, using moderate power from his transceivers. He should still put out a good signal worldwide from his location.

It also is envisioned that Dave will have six meters available with a keyer on 52,170 from his shack, using a TS660 plus amplifier. This equipment has been loaned by Gil VK3AUI. Other equipment has been loaned by the VK6 gang.

VK6FS AWARD

Speaking of VBK6, Hugh—VK6F(lying)S(aucers)—one of the original organizers of Dave's last expedition to Heard Island became an SK after the expedition returned to VK. He had the distinction of being the first into the log os VKØHI on Dave's last expedition. To honour his memory, the VK6 Division of the WIA, with a bequest of a small sum of money by Hugh, has created a DX achiever's award. I feel it would be fitting if Dave was to be the first to achieve this award, in Hugh's memory, not only for what he has done for the world's DX fraternity, but for his attitude of giving the disadvantaged DXer a chance to work a rare one, and his nonprofit approach to amateur radio—a refreshing approach and one within the true spirit of amateur radio.

NETHERLANDS

Jos. A. Stierhout PAØVDZ
PO Box 265
6950 AG Dieren–NL

The Netherlands

[*Slow but certain: In June we wrote a note to Jos in the International section (under "Notes from FN42, of course) which he received in August, and here is his response. Will he want to be a regular correspondent? Watch this space for up-to-date news only a month or so old.—Ed.*]

In Holland we have a population of about 14.5 million and about 15,000 amateurs with the A, B, C, or D license. Every year the VRZA (the Netherlands ham amateur society) organizes a big Radio Campingweek in the most wooded part of Holland: Laag-Soeren, near Arnhem—well-known by soldiers in WWII. It is always held during the week of Ascension Day—so it was May 23–30 in 1987.

The "Jutberg" is a big camping and holiday park with many facilities. This year we had more than 100 calls plus their families, with caravans, tents, campers, and in about 40 bungalows. Fox-huntings and sputnik (a very small transmitter with only *bleep–bleep* signals) huntings on 3.5, 144, and 432 MHz were popular. There were a total of 17, for OMs, (X)YLs, and QRPs. There were specialities for the different days: Sunday, a puzzle-walk through the beautiful woods for the whole family and visitors, and a "Ladies Cafe" in the evening for XYLs

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only. Tuesday: for the OMs, an excursion to the biggest cycle factory in Holland, in Dieren, and for the ladies a demonstration and lecture for making Chinese food (Mi-Hoen). That evening everybody was eating Chinese!

On Wednesday we had another high spot: a barbecue party with a 45-person Big Brassband which later guided a children's procession with Chinese lanterns, and later, dumplings.

Ascension Day itself is always the busiest. We had a flea market, and 1,000–1,500 visiting hams came from everywhere. The General Post-office was there (they are the ones who give the licenses) with a stand from the R.C.D. (Radio Control Service), and a video was shown of their work. They demonstrated filters for avoiding BCI and TVI, and gave a complete computer report of TX and RX from hand-held 2-meter portables. In the evening there was Bingo with $2,000 worth of prizes, such as a Philips computer, donated by many sponsors.

The crowds begin top thin out at this point, and Friday was nearly the end, with a 5-man dance band playing until early Saturday morning. Then there was a goodbye meeting over coffee, and discussions about what to do for the next Amateur Radiocamp in 1988—which will be the 25th camp.

Besides the organization crew, there were two for daily transmissions: one for the daily camping broadcast giving the results of competitions, DX news, weather forecast, etc., and the other for the daily ATV transmissions, showing what the video group had filmed in the camp during the day—with interviews, weather cards, etc. During the whole week, XYLs were making QSOs with the whole world!

Are you interested in our 1988 plans? Write to me and ask!

PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril 2765
Portugal

EA9 DXpedition. The Lynx DX Group of Spain organized an international DX convention in the Principality of Andorra last May. The group's chairman was Juan Rosales EA9IE. Among the subject discussed was a proposed DXpedition to the Saharaui Republic (Spanish Sahara—Rio de Oro—EA9land) for which the call will be S0RASD. Details will be announced. Information may be obtained from the Lynx DX Group, PO Box 351, 26080 Logrono, Spain.

Marti Laine OH2BH (L) and Juan Rosales EA9IE in Andorra. F6EXV in background. (Photo by CT4NH)

New Look for REP. The new board of directors for REP (Rede do Emissores Portugueses) is doing much to give us a whole new look. If you are in Lisbon, do not hesitate to visit this old and interesting club, at Rua D. Pedro V 7, 4th floor (telephone: 36 11 86). A personal computer has been bought for the club; and every Thursday their Radio Bulletin is transmitted on VHF (later on HF) with information about DX, awards, club news, and so on.

CT1AVW is back. Our good friend, Bob Arceneaux CT1AVW (K5ODD in the USA), is back in Lisbon. He works for the American Embassy, and came to replace Don Reibhoff exCT4AT, who died in a tragic accident in Spain. [*See Portugal in the International column for July, 1987.*] Bob has had several nice calls in the past, like 5A4TH—and 5A1TS club station—(1957/58), EL2AC (1963/65), PY1ZAZ (1971/74), and PT2ZAI (1982/86).

We also have another American Embassy friend, Joe Lutz, around; he often uses CR7DKG for contests. Among several calls, he has been W7ZQV-KG6, KG6AAY, W7LPF-DU2, and 5B4.

SWEDEN

Rune Wande SM0COP
Frejavagen 10
S–155 00 Nykvarn
Sweden

(L to R, standing) CT1UA, CT4NH, OH2BH; CT3BM and C31LD in front. (Photo by CT4NH)

This continues SM0COP's report, begun in the November, 1987, issue.

THE SM HAM POPULATION

The total number of ham licenses is a little over 11,000. If you leave out the club stations (SK and SL prefixes), the number of private licenses is 10,400. The 1986 increase was 2%. Sweden has four classes of license: A, B, C, and T. Class A is the highest, with all band/mode privileges and 500-Watt power input. Class T (Technician) is a no-code license for VHF/UHF.

There are thoughts of restructuring this system in order to get a better correspondence with the licensing systems in other European countries. One of the discrepancies is the code requirement. For SM Class A, a code speed of 80 letters/minute (16 wpm) is required, while most other countries require only 60 (12 wpm). The Class B would be discontinued. The remainder would be a Novice Class and an Advanced Class for HF and VHF/UHF, and a no-code Technician license for VHF/UHF.

These thoughts are just in a very early discussion stage, and have come up primarily in order to facilitate the comparison of licenses for the European visitor license according to the CEPT recommendation. The CEPT license was not implemented in Sweden this tourist season, and visiting hams from other European countries had to apply for a regular visitor license as before.

NEW AWARDS PROGRAM

SSA (the Swedish national amateur radio league) has renewed its award program. The new awards of international interest are WASA (worked All Sweden Award), HASA (Heard All Sweden Award), and SLA (Swedish Locator Award). January 1, 1988 is the starting date for these, and in my next column I will give you details.

To give you a fair chance to finish for WASM I and WASM II, the last date for valid contacts for these two awards is December 31, 1989. This means that if you have not started hunting, you can go for both old and new awards during the coming two years! Good luck! 73

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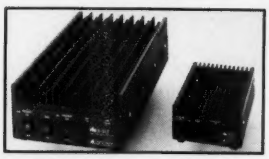

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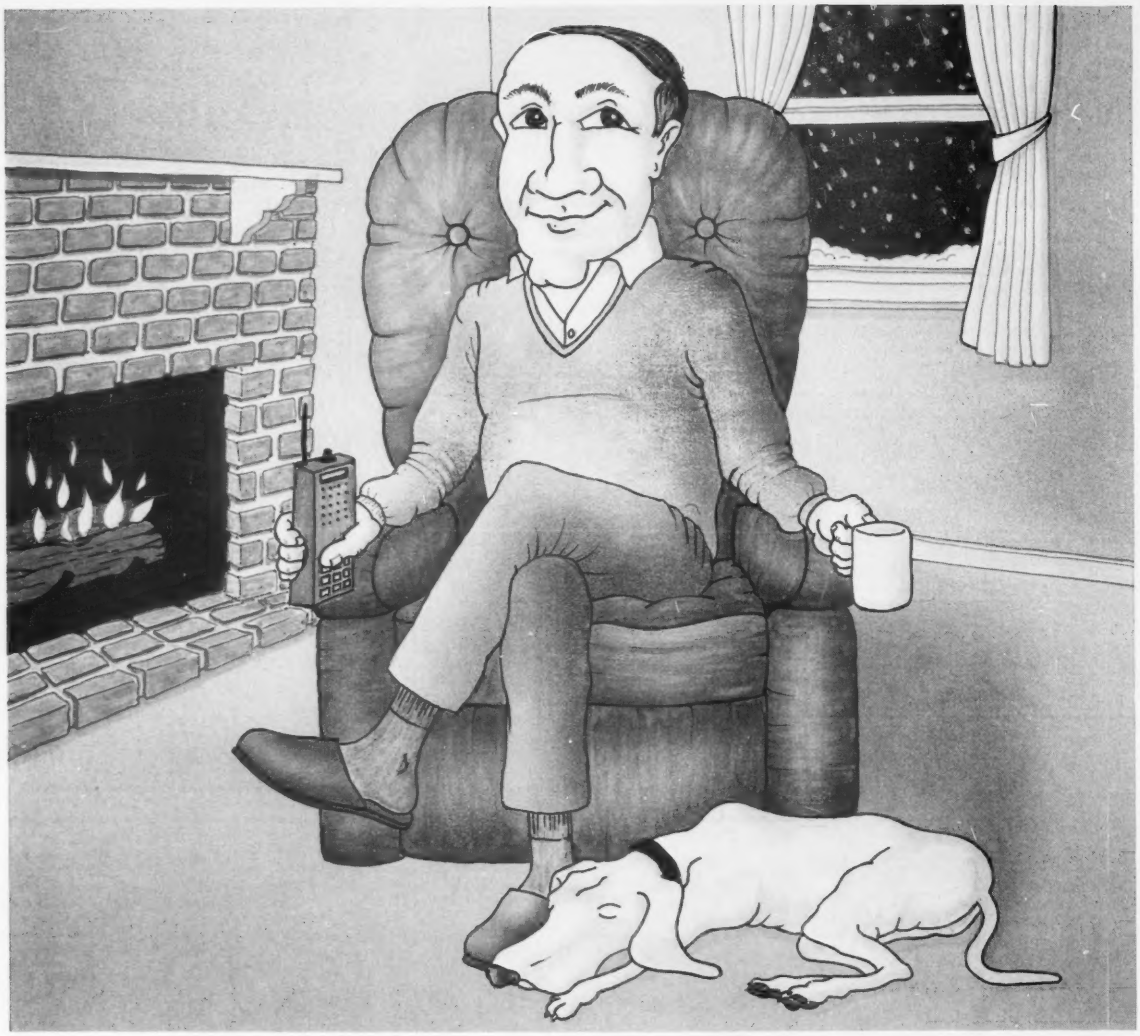

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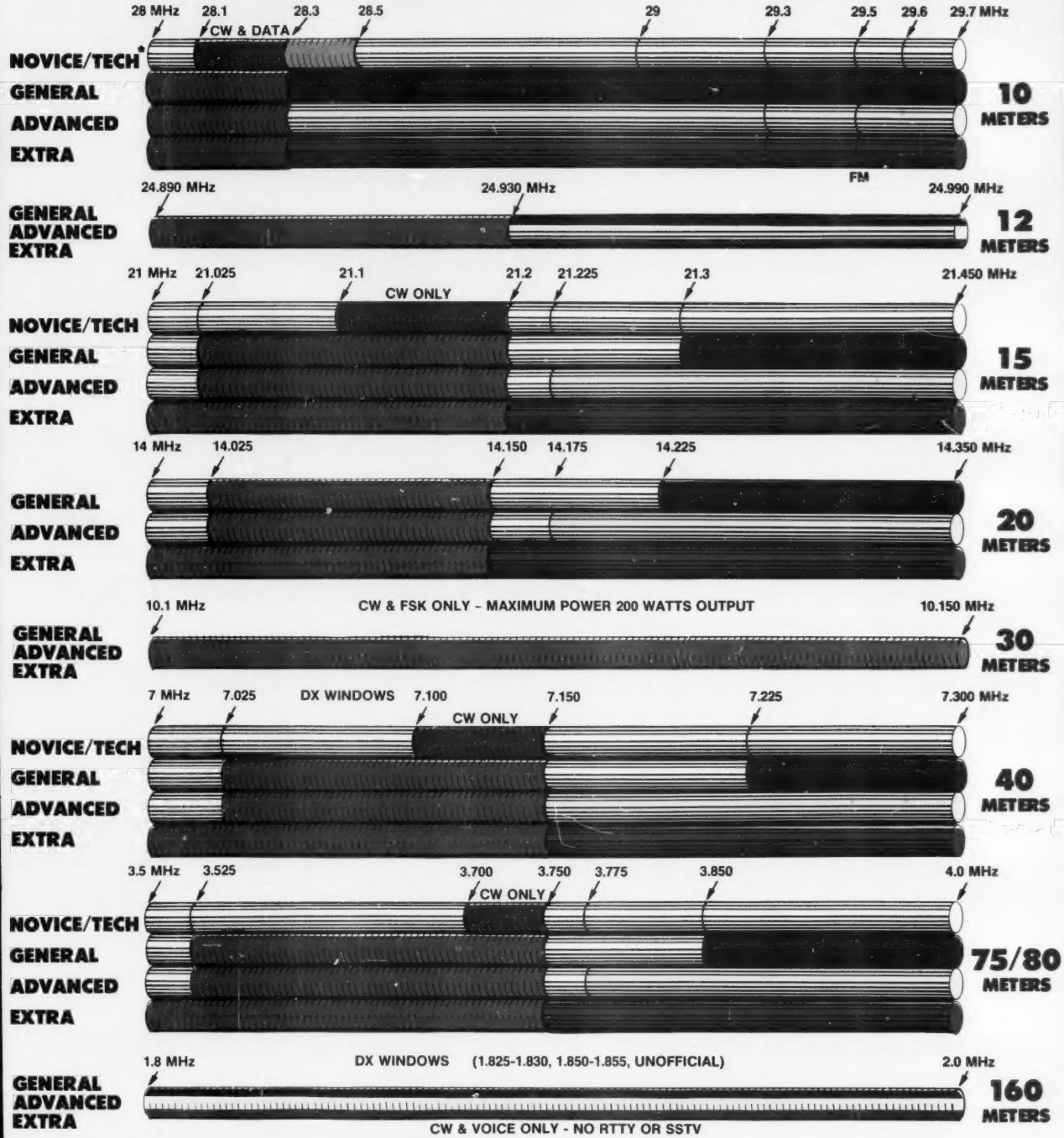

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A3	Tonga	HS	Thailand	T7	San Marino	YV-YY	Venezuela
A4	Oman	HV	Vatican	TA-TC	Turkey	YVØ	Aves Is.
A5	Bhutan	HZ	Saudi Arabia	TF	Iceland	Z2	Zimbabwe
A6	United Arab Emirates	I	Italy	TG, TD	Guatemala	ZA	Albania
A7	Qatar	ISØ, IMØ	Sardinia	TI, TE	Costa Rica	ZB2	Gibraltar
A9	Bahrain	J2	Djibouti	TI9	Cocos Is.	ZC4	UK Sov. Base on Cypress
AP-AS	Pakistan	J3	Grenada & Dep.	TJ	Cameroon	ZD7	St. Helena
BV	Taiwan	J5	Guinea-Bissau	TK	Corsica	ZD8	Ascension Is.
BY,BT	China	J6	St. Lucia	TL	Central African Republic	ZD9	Tristan da Cunha & Gough Is.
C2	Nauru	J7	Dominica	TN	Congo	ZF	Cayman Is.
C3	Andorra	J8	St. Vincent & Dep.	TR	Gabon	ZK1	So. Cook Is.
C5	The Gambia	JA-JS	Japan	TT	Chad	ZK1	No. Cook Is.
C6	Bahamas	JD1	Minami Torishima	TU	Ivory Coast	ZK2	Niue
C8-9	Mozambique	JD1	Ogasawara	TY	Benin	ZK3	Tokelau Is.
CA-E	Chile	JT-JV	Mongolia	TZ	Mali	ZL-ZM	New Zealand
CE9/KC4	Antarctica	JW	Svalbard	UA1, 3, 4, 6	European Russian R.S.F.S.R.	ZL7	Chatham Is.
CEØA	Easter Is.	JX	Jan Mayen	UA1	Franz Josef Land	ZL8	Kermadec Is.
CEØX	San Felix	JY	Jordan	UA2	Kaliningrad	ZL9	Auckland & Campbell Is.
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CN	Morocco	KC6 (W. Caroline Is.)	Belau	UC	Byelorussia	ZR2-ZU2	Prince Edward & Marion Is.
CP	Bolivia	KG4	Guantanamo Bay	UD	Azerbaijan	ZR3-ZU3	(Namibia) S.W. Africa
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CV-CX	Uruguay	KH4	Midway Is.	UI	Uzbekistan	3B6, 7	Agalega & St. Brandon
CYØ	Sable Is.	KH5	Palmyra, Jarvis Is.	UJ	Tadzhikistan	3B8	Mauritius
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D2, 3	Angola	KH6	Hawaiian Is.	UM	Kirghizia	3C	Equatorial Guinea
D4	Cape Verde	KH7	Kure Is.	UO	Moldavia	3CØ	Pagalu Is.
D6	Comoros	KH8	American Samoa	UP	Lithuania	3D2	Fiji Is.
DA-DL	Fed. Rep. of Germany	KH9	Wake Is.	UQ	Latvia	3D6	Swaziland
DU-DZ	Philippines	KHØ	Mariana Is.	UR	Estonia	3V	Tunisia
EA-EH	Spain	KL7	Alaska	V2	Antigua, Barbuda	3W, XV	Vietnam
EA6-EH6	Balearic Is.	KP1	Navassa Is.	V3	Belize	3X	Guinea
EA8-EH8	Canary Is.	KP2	Virgin Is.	V4	St. Christopher & Nevis	3Y	Bouvet
EA9-EH9	Ceuta and Melilla	KP4	Puerto Rico	V8	Brunei	3Y	Peter Is.
EI-EJ	Ireland	KP5	Desecheo Is.	VE, VO, VY	Canada	4P-4S	Sri Lanka
EL	Liberia	KX6	Marshall Is.	VK	Australia	4U	I.T.U. Geneva
EP-EQ	Iran	LA-LN	Norway	VK	Lord Howe Is.	4U	Hdqtrs., United Nations
ET	Ethiopia	LO-LW	Argentina	VK9	Willis Is.	4W	Yemen
F	France	LX	Luxembourg	VK9	Christmas Is.	4X, 4Z	Israel
FT8W	Crozet	LZ	Bulgaria	VK9	Cocos-Keeling Is.	5A	Libya
FT8X	Kerquelen Is.	OA-OC	Peru	VK9	Mellish Reef	5B	Cyprus
FB8Z	Amsterdam & St. Paul Is.	OD	Lebanon	VK9	Norfolk Is.	5H-5I	Tanzania
FG	Guadeloupe	OE	Austria	VKØ	Heard Is.	5N-5O	Nigeria
FG, FS	Saint Martin	OF-OI	Finland	VKØ	Macquarie Is.	5R-5S	Madagascar
FH	Mayotte	OHØ	Aland Is.	VP2E	Anguilla	5T	Mauritania
FK	New Caledonia	OJØ	Market Reef	VP2M	Montserrat	5U	Niger
FM	Martinique	OK-OM	Czechoslovakia	VP2V	Brit. Virgin Is.	5V	Togo
FO	Clipperton Is.	ON-OT	Belgium	VP5	Turks & Caicos Is.	5W	Western Samoa
FO	French Polynesia	OX	Greenland	VP8	Falkland Is.	5X	Uganda
FP	St. Pierre & Miquelon	OY	Faroe Is.	VP8, LU	South Georgia Is.	5Y-5Z	Kenya
FR/G	Glorioso Is.	OZ	Denmark	VP8, LU	South Orkney Is.	6V-6W	Senegal
FR/J, E	Juan de Nova, Europa	P2	Papua New Guinea	VP8, LU	South Sandwich Is.	6Y	Jamaica
FR	Reunion	PA-PI	Netherlands	VP8LU, CE9, HFØ, 4K1	South Shetland Is.	7O	People's Dem. Rep. of Yemen
FR/T	Tromelin	PJ2-4, P4	Neth. Antilles	VP9	Bermuda	7P	Lesotho
FW	Wallis & Futuna Is.	PJ5-8	St. Maarten, Saba, St. Eustatius	VQ9	Chagos	7Q	Malawi
FY	French Guiana	PP-PY	Brazil	VR6	Pitcairn Is.	7T-7Y	Algeria
G	England	PPØ-PYØ	Fernando de Noronha	VS6	Hong Kong	8P	Barbados
GD	Isle of Man	PPØ-PYØ	St. Peter & St. Paul Rocks	VU	India	8Q	Maldive Is.
GI	Northern Ireland	PPØ-PYØ	Trinidade & Martin Vaz. Is.	VU	Andaman & Nicobar Is.	8R	Guyana
GJ	Jersey	PZ	Suriname	VU	Laccadive Is.	9G	Ghana
GM	Scotland	S2	Bangladesh	XA-XI	Mexico	9H	Malta
GU	Guernsey & Dep.	S7	Seychelles	XA4-XI4	Revilla Gigedo	9I-9J	Zambia
GW	Wales	S9	Sao Tome & Principe	XT	Burkina Faso	9K	Kuwait
H4	Solomon Is.	SA-SM	Sweden	XU	Kampuchea	9L	Sierra Leone
HA, HG	Hungary	SN-SR	Poland	XW	Laos	9M2, 4	West Malaysia
HB	Switzerland	ST	Sudan	XX9	Macao	9M6, 8	East Malaysia
HBØ	Liechtenstein	STØ	Southern Sudan	XY-XZ	Burma	9N	Nepal
HC-HD	Ecuador	SU	Egypt	Y2-9	German Dem. Rep.	9Q-9T	Zaire
HC8-HD8	Galapagos Is.	SV-SZ	Greece	YA	Afghanistan	9U	Burundi
HH	Haiti	SV/A	Mount Athos	YB-YH	Indonesia	9V	Singapore
HI	Dominican Republic	SV5	Crete	YI	Iraq	9X	Rwanda
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HKØ	Malpelo Is.	T2	Tuvalu	YK	Syria	J2/A	Abu Ail, Jabal at Tair
HKØ	San Andreas & Providencia	T3Ø	W. Kiribati (Gilbert & Ocn Is.)	YN	Nicaragua		
HL	Korea	T31	C. Kiribati (Brit. Phoenix Is.)	YO-YR	Romania		
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THE DX YEAR IN REVIEW

DX and DXers excelled in 1987. Low-band propagation was the best in years, especially on 160 meters. As expected at the bottom of the sunspot cycle, low level solar activity and a minimum of solar-generated noise kept long-haul propagation on 160 meters well above average. Even the usually-difficult polar path opened wide several days a week during the winter months. ON4UN made good use of the conditions on 160 meters (and the new 160 meter allocation in Belgium) to work more than 100 countries on the band in the first few weeks of 1987! The same low absorption and good polar propagation helped 40 and 80 meters as well, and many DXers added to their band-countries totals in 1987.

The higher bands were remarkably good, considering that we were at a solar minimum. Twenty meters often stayed open well past local sunset, and the low absorption permitted lots of long-haul QSOs. Russian signals poured over the North Pole for much of the year to the delight of oblast chasers. Fifteen meters opened occasionally with good signals on east-west paths as well as the easier north-south paths. Even 10 meters opened between the East Coast and Europe and between the West Coast and Japan a few days of the year. This will soon occur daily. Evidence mounted all year that Sunspot Cycle 22 began in September 1986.

A Boost for Awards

The DX Century Club Golden Jubilee was an enormous success. Thousands of DXers worldwide applied for the handsome award. Pileups were fierce at the beginning of the year. DXers raced to work the easy countries all over again. Although the concept of a "fresh start" for DXCC won little support, DXers didn't hesitate to "start over" for the Golden Jubilee award. The award spurred some interesting competitions, as DXers defined their own version of the award. Some aimed for working 100 countries in the shortest time, such as W6GO, who worked country #100 at 0042Z on Jan. 3, just over 48 hours into the new year. Other DXers set their other goals, such as QRP or single band. A few dozen dedicated DXers earned DXCC Golden Jubilee Times 2, by working more than 200 countries in 1987! More than 280 of the 317 DXCC countries were on the air in 1987.

A host of active resident (or long-term visitors) boosted DXers' country totals resident (or long-term visitor) operators. The best example of this is China, which was the Most Wanted country in the world as recently as 1980. More than a dozen active BY stations, and good polar propagation, put BY in thousands of logs. 5A0A in Libya was the most workable 5A station in years, and 7J1ACH on Minami Torishima made more than 20,000 QSOs in 1987. Other active rare stations included 9N1MM in Nepal, VK0GC on Macquarie Island, ZL8HV on Raoul Island in the Kermadecs, JX9CAA on Jan Mayen, SP5EXA/JW on Spitsbergen, and FT8ZA and FT8XA in the French Antarctic countries.

The Year of The DXpedition

If a single word characterizes DX in 1987, it is DXpedition. Dozens of well-organized and well-run DXpeditions made hundreds of thousands of contacts with deserving DXers worldwide.

The highlight of the year was, of course, the Peter 1 Island DXpedition by 3Y1EE (LA1EE) and 3Y2GV (LA2GV). Einer and Kare braved isolation, sub-zero temperatures, limited food, and enormous pile-ups, to put Peter 1 on for the first time ever. The pair made more than 15,000 contacts on all bands and modes, while operating almost non-stop. Kare actually fell asleep at the rig on more than one occasion. That's dedication!

Photo A. Martha WN4FVU and Carl WB4ZNH Henson were among the 4M0ARV Aves Island DXpeditioners.

The Aves Island 4M0ARV trip, and the Revillagigedo XF4DX DXpedition were also highly successful DXpeditions. Miss Bharathi VU2RBI led about two dozen Indian amateurs to the Andamans VU4. She worked 15,000 DXers herself during her 45-day stay. The Greeks finally managed to activate Mount Athos SY for the first time since the early 1980s.

Many small groups and individual DXers showed that DXpeditions don't have to involve dozens of amateurs, nor cost tens of thousands of dollars. Bob Winn W5KNE and Jim Smith VK9NS opened Cocos-Keeling VK9Y and were followed by a host of others. Jim went on to Christmas Island VK9X, to the delight of many DXers. Some of the Reunion Island hams put the tough French African islands on the air: Tromelin, Juan de Nova, and Glorioso. And, of course, The Colvins—Lloyd W6KG and Iris W6QL—spent the winter operating from that same region. Wallis Island VK9W, Cocos TI9, and Heard VK/0, were all active in 1987, thanks to DXpeditioners. Brazilian amateurs managed to activate all three PY0 islands in 1987: St. Peter and St. Paul Rocks, Trindade, and Fernando de Noronha. Even the Russians got into the act with numerous DXpeditions to rare oblasts throughout the country.

There were a few flies in the DXer's ointment in 1987. Two ground-breakers in DX are now Silent Keys: Don Reibhoff K7ZZ and Joe Ahumada LU2DX. Don was a mainstay from Southeast Asia in the '60s and '70s, and successfully promoted amateur radio throughout the region. Joe was a pioneer DXpeditioner in the 1950s, paving the way for hundreds of others in later years. They will be sorely missed. Iris Colvin slipped and broke her hip in the Maldive Islands, but was up and around at Visalia and Dayton. She is off again with Lloyd on their annual multi-country DXpedition.

The Outlook for 1988

The DX outlook for 1988 is very favorable. Sunspots will swing back quickly to bless DXers with good 15-, 12-, and 10-meter openings. Twenty should provide DX possibilities most of the day and night. The low bands should be fair to good in 1988, before increasing solar activities raises the noise level too much. Several major DXpeditions are in the planning stages for 1988, and even if just a few of them come off, it will be another good year for DXers! Look for Bouvet 3Y, Vietnam XV, Spratly 1S, Andamans VU4, South Sandwich and South Georgia VP8, Marion Island ZS8, Laccadives VU7, and others next year.

DXers can keep up to date on current happenings in DX by subscribing to one of the weekly DX newsletters. To help at least one reader of this column improve his or her DX score in 1988, I will give away a free one-year subscription to The DX Bulletin Just send your name, call, and address (or a QSL card) to P.O. Box 4881, Santa Rosa CA 95402, before the end of 1987. On January 1, 1988, I'll pull one card out of my hat, and send that lucky DXer a free subscription. Good DXing in 1988! 73

Photo B. Japan DX News editor JR1AIB (left) greets 1987 DXpeditioners Einer LA1EE/3Y1EE, Miss Bharathi VU2RBI/VU4APR, and Mr. Suri VU2MY/VU4APR.

Number 2 on your Feedback card

Bob Heil K9EID
Heil Boulevard
Marissa IL 62257

Remote Base Control

Work DX from your HT!

During the past few years, the cost of commercial VHF and UHF FM equipment for the amateur market has dropped radically. This fact, coupled with the popularity of small hand-held transceivers, has led many amateurs into building remote-base systems, which can increase the range of a hand-held from a few miles to hundreds or even thousands of miles.

What Is a Remote Base?

A remote base is not a repeater, although the two are similar. A remote-base system (RBS) usually consists of two transceivers operating in a crossband-linked mode, as shown in Fig. 1. One of the linked stations has *complete* control over the link operation. This control station turns the link on and off and performs other control functions over the air.

In contrast, a repeater *cannot* be controlled on the input frequency. The frequencies used for a remote base are not important, except that the controlling station must operate at or above 220.5 MHz and only unoccupied simplex channels should be used (to prevent QRM to repeaters and other simplex users).[1]

A remote-base system can effectively turn a portable QRP transceiver into a high-power base station with high antenna gain. Many remotes use 10-meter equipment located on a mountaintop or tall building and control this remote with a UHF or VHF link; DX stations can be worked from a hand-held or mobile station using this setup. At W9GOE/R in Marissa, Illinois, a remote 10-meter FM system is linked on 220 MHz to the 2-meter repeater, allowing the 2-meter users to enjoy the fun and thrill of working DX through the 2-meter repeater.

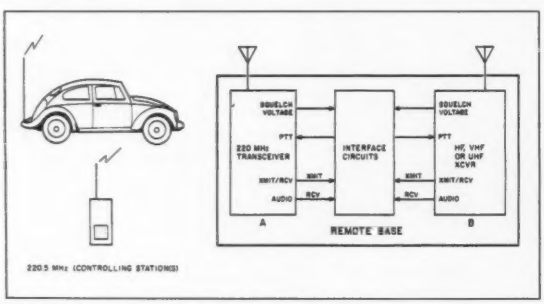

Fig. 1. Block diagram of the remote-base system.

Build a Simple Remote Base

Interconnection of two transceivers for remote-base operation is simple and can be accomplished without a lot of sophisticated control and audio interface circuitry. Refer to Fig. 1. The squelch circuit of transceiver A activates the PTT line of transceiver B. At the same time, speaker audio is applied to the microphone input. This is basically how a repeater operates, but, in an RBS, the repeating process is reversible. The squelch circuit of transceiver B controls the PTT line of transceiver A, and so on.

Finding the proper control voltage in the squelch circuit of each transceiver is perhaps the most difficult task in building the remote base. Many of the newer radios have an LED to indicate signal presence (open squelch). Usually, a one-transistor switch in the squelch circuit supplies positive voltage for the LED. This positive voltage can control the circuits in the remote-base interface. Fig. 2 is the schematic diagram of the simple remote-base T-R control interface for transceivers using either positive-voltage (active high) or negative-voltage (active low) squelch circuits.

Audio coupling between transceivers is achieved by connecting the speaker output of one unit through a limiting and pre-emphasis network to the microphone input of the other. Microphone output levels are on the order of 50 uV and a speaker output may provide 2 or 3 volts, so an attenuator potentiometer must be used. A 4.7-kilohm resistor and a 0.004-uF capacitor provide proper audio shaping. Fig. 3 shows a typical circuit.

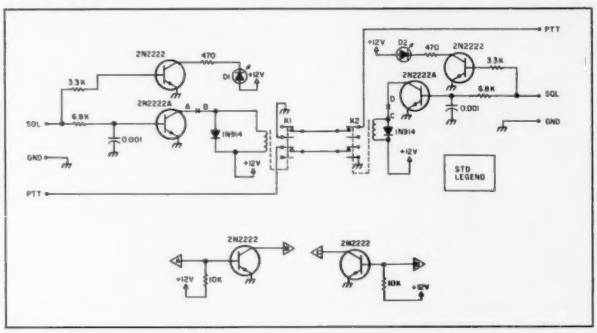

Fig. 2. Schematic diagram of the remote-base control interface. Use the circuit shown in A for transceivers that provide an "active high" from the squelch circuit; insert the components shown in B at points A, B, C, and D for "active low" squelch circuits (D1, D2—red light-emitting diodes; K1, K2—DPDT relays, 12-V coil, 2-A contacts).

Testing

Once the circuits are wired and the transceivers are connected, testing of the circuit is simple. Rotate the squelch control of transceiver A until white noise is heard. This should activate the PTT line on transceiver B; white noise should be heard in a third receiver tuned to output frequency B. Adjust the level-control potentiometer for proper deviation. Rotate the transceiver A squelch control back to the "quiet" position and repeat the same tests for transceiver B.

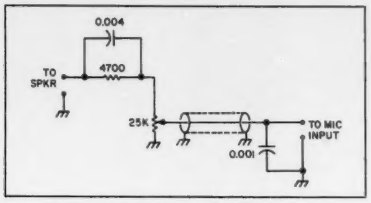

Fig. 3. Schematic diagram of the remote-base audio circuitry. This circuit must be duplicated to interface each transceiver.

Other Thoughts

Many types of control circuitry can be added to the remote base to provide nice features. Why not use a DTMF (dual-tone multi-frequency) pad and associated decoder to change the remote-base frequencies? Should you really get carried away, you could even build circuits that would remotely turn a directional antenna.

"A remote base is not a repeater."

The new series of HF rigs (TS-430S, IC-740), which have active squelch circuits that operate on SSB signals, allow the remote-base control to be used between the VHF or UHF control frequency and any of the HF bands. This allows you to move around freely with a rubber ducky/HT on VHF talking on 20 or 40 meters, let's say. It is truly talking to the world with your rubber ducky!

All that is necessary is to find the point in the HF rig where that squelch circuit raises a voltage potential from 0 to 3–4 volts DC when a signal is received.

The success and fun of an RBS is limited only by the imagination and skill of the builder. Why not grab a soldering iron and build yourself a system? It *will* pique your interest in VHF FM! 73

References

1. See FCC regulations, Part 97.61(d).
2. Parts for the remote-base system are available from Heil Sound, Ltd., No. 2 Heil Drive, Marissa IL 62257.

Bob K9EID, founder of Heil Sound, Ltd., was a pioneer in VHF and UHF work in the early '60s. He was named Ham of the Year at Dayton in 1982 for attracting young people into ham radio.

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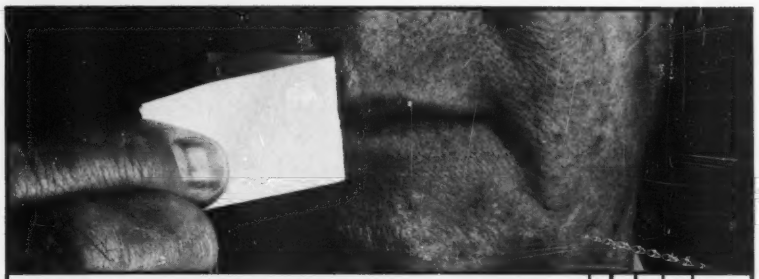

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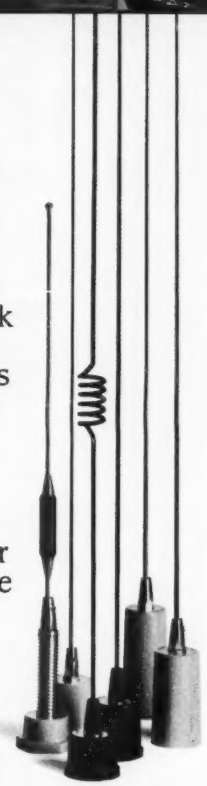

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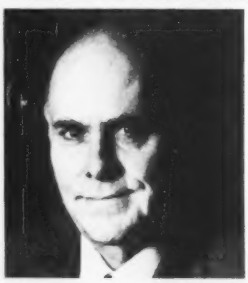

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HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free, on a space available basis. To make our job easier and to ensure your listing is correct, please type or print your request clearly on a full (8½ x 11) sheet of paper. Double space and use upper and lower case letters where appropriate. Also, write numbers carefully—a 1, for example, can be read as an I or an i or a 7. Thanks.

I am looking for a code practice program for my CoCo (Radio Shack's color computer).

Brandon Armstrong
635 Chamberlain #8
El Cajon CA 92020

I am looking for modifications, additions, and improvements for the HAL ST-6 Teletype converter. Also, need manual and schematic for TS-888 Teletype test set.

Marvin Moss W4UXJ
P.O. Box 28601
Atlanta GA 30358

Need service info for the following. I will purchase or pay copy cost. Unicom Electronics Power Supply Model Ps-11R, Tandy 64K Color Computer II Model 26-3127, EMP/GTS Manual Mini Modem Model MM-101 (manufactured by Elec and Johnson Messenger CD Model 323, Apple IIe Pro System Duo-Disk, Imagewriter, Printer Monitor II, ICOM Model 735 Ham Transceiver, Loonam Assoc. Modem Model FM30, Designers for Industry Mutual Conductance Tube Tester Model TV2CU (F.A.A.), Amplifier/ Marker Jerrold Model CM-6C (F.A.A.), Signal Generator URM-64A/TS-419, and RCA Video Disc Player Model SGT-250.

Need the following. Please state price and/or condition in correspondence. Two (2) Transistors MRF 455 A; Five (5) Tubes 7868; Ten (10) lamps #12 6V for Bogen PA Amps; One (1) Each Bandswitch for Panasonic rF 2800 Receiver #RSR 98W or Equivalent; One (1) Printer and Disk Drive for the Tandy Color Computer II Model 26-3127 and One(1) each Z-80/CPM for the Apple IIe Pro System.

Mike Adams
Haney Vo-Tech Center
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Panama City FL 32405

I need schematic and service info for a Tektronics model 502 Oscilloscope. Will gladly pay copying and mailing costs.

Gordon Fulp
4740 Scotch Pine Lane
Placerville CA 95667

Can anyone supply a photostat or other copy of the Electronics Illustrated article (circa 1970) that dealt with the schematic and power supply for the micro oscilloscope featured in the January 1970 issue.

Randy White KB4ALH
506 Robinhood Dr.
Seneca SC 29678

I am seeking schematic and alignment data for a National NC-109 Communications Receiver. First submission gets payment, if not prohibitive. Submit proposal.

Lloyd Williams KA0ZCY
RR 1, P.O. Box 248
Baxter Springs KS 66713

I am looking for a manual or schematic for COMMERCIAL TRADES INSTITUTE SC 36 Scope. Needs a transformer.

Jim Wisdom K4HCG
3308 Cobblestone Ct.
Raleigh NC 27607

I am looking for other people who have built the project found in the May '80 issue of *73*, called "The Beachside 2-Meter Beam" (p. 132). I've built it, but have tried everything without success to get rid of the high SWR, and to even get some range on it. Please share your success tips with me.

Dick Wolf N8IHN
1890 Big Trail Rd.
Walled Lake MI 48088

I am looking for a manual or any information on a Gonset G-150 Business Communicator. It appears to be a single channel VHF transceiver, but I have no x-stal information. Would gladly pay costs for copying manual, or would make copy of your original and return. Thanks and 73's.

Daron Wilson N7HQR
P.O. Box 714
Toledo, OR 97391

EICO 470 o'scope power transformer needed. Anyone out there have a junker scope with a good transformer? Send price to:

Pete Haas
P.O. Box 702
Kent, Ohio 44240

I'm looking for a manual/schematic/calibration procedure for a Boonton RF Voltmeter, Model 91CA. Also a manual/schematic for a Realistic DX-150-B receiver.

James W. Lee
WB4GWX/AAV6UX
5004 Ridge View Court
No. Richland Hills, TX
76180-2521

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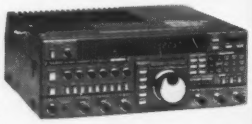

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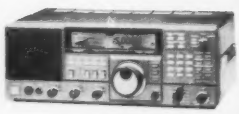

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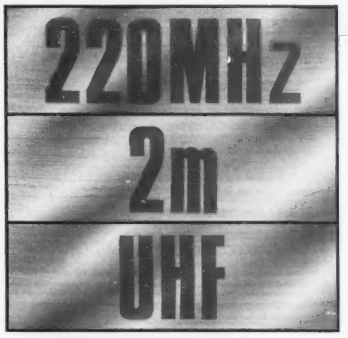

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